Metals Review
THE NEWS DIGEST MAGAZINE

Volume XXIII, No. 1 January, 1950

FEB 14 1950
PITTSBURGH, PA.

NO WASTE DISPOSAL PROBLEM WITH SALT BATHS

Method of Calculation for Martensite

$Ms(F°) = 930°F. - 570 \times C - 60 \times Mn - 50 \times Cr - 30 \times Ni - 20 \times Si - 20 \times Mo - 20 \times W$

Austempering*

A method of hot quenching a ferrous alloy above the martensite transformation range but below the pearlite range.

Types

11 steels or more may be austempered in sizes from 0.148 to 1" or larger. Hardness Values – 52 to 60 Rc.

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3. Simultaneous descaling
4. Shorter time cycle
5. Less labor

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*Austempering process — patents owned by U. S. Steel Corporation

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Metals Review

THE NEWS DIGEST MAGAZINE

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A.S.M. REVIEW OF METAL LITERATURE

ORE BENEFICIATION 14
Preparation and Concentration

SMELTING, REDUCTION AND REFINING 15
(Including Electrolytic Refining)

PROPERTIES 17
Physical, Mechanical and Chemical

CONSTITUTION AND STRUCTURE 22
Metallography, Constitution Diagrams, Crystal Structure

POWDER METALLURGY 24
Processes and Products

CORROSION 25
Theory, Measurement, Prevention (Except Coatings)

CLEANING AND FINISHING 26
Chemical and Mechanical; All Types of Coatings Except Electrodeposited

ELECTRODEPOSITION AND ELECTROFINISHING 28
(Plating, Electropolishing, Electroforming)

PHYSICAL AND MECHANICAL TESTING 30
(Including Stress Analysis)

ANALYSIS 31
Qualitative and Quantitative; Identification Methods

APPARATUS, INSTRUMENTS AND METHODS 33
Industrial Measurement and Control (Except Temperature); Laboratory Equipment and Procedures

INSPECTION AND STANDARDIZATION 34
(Including Quality Control, Radiography, Specifications)

TEMPERATURE MEASUREMENT AND CONTROL 35

FOUNDRY PRACTICE 35
Methods and Equipment (Except Furnaces)

SCRAP AND BYPRODUCT UTILIZATION 37

FURNACES AND HEATING DEVICES 38
(Including Induction and Resistance Heating Equipment)

REFRACTORIES AND FURNACE MATERIALS 39

HEAT TREATMENT 40
(Including Flame Hardening, Induction Heating, Cold Treatment)

WORKING 40
Rolling, Drawing, Forging, Stamping and Presswork, Shot-Peening

MACHINING 42
(Including Tools, Machinability and Cutting Fluids; Excluding Flame Cutting)

MISCELLANEOUS FABRICATION 44
General Manufacturing and Assembly Procedure; Plant Operations; Materials Handling

JOINING AND FLAME CUTTING 45
Welding, Brazing and Soldering

APPLICATIONS 48
General and Specific Uses of Metals

DESIGN 50
Metallurgical Factors in Design of Parts, Equipment and Structures

MISCELLANEOUS 51
(Including Research, Lubrication and Friction; Other General and Unclassified Subjects)

IMPORTANT LECTURES

Shepherd Cautions Against Use of Over-simplified Hardenability Test Data . 4

Metal Problem Solutions Based on Nuclear Physics—Bernard Waldman . 4

Joe Asbestos Studies Chemistry at 1600° C.—Karl L. Fetters 5

Mathematical Equations Applied to Formability—John E. Dorn . . . 5

Fatigue Tests Lead to Better Designs—Arthur F. Underwood 6

Corrosion Exposure Tests Show Striking Differences in Different Atmospheres—C. H. Sample 6

Titanium One of Our Most Abundant Metals —Bruce W. Gonser . . . 6

Machinability Test Leads to Improved Heat Treatment—G. C. Riegel . . 7

Application of Welding to Local Products—H. W. Heimke 8

Ductile Cast Iron—Jack C. Neemes . 8

"Quality Steel" Cannot Substitute for Improper Design—Harry W. McQuaid 9

Principles Behind Use of Furnace Atmospheres—E. G. deCoriolis . . . 9

Ingenious Method Used to Evaluate Hot Workability—Harry K. Ihrig . . . 9

Powder Metallurgy at Crossroads—Carl G. Johnson 10

Advantages of Carbonitriding—Michael B. Bever 10

New Magnaflux Test Methods—Kermit Skeie 11

Metallurgical Aspects of Nuclear Reactors—John P. Howe 52

Production Figures Show Wider Use of Stainless Sheet—E.E. Thum . . . 54

Ship Structures and Hardenable Steels Pose Problems in Welding—S. L. Hoyt 54

Notch Tests Indicate Reliability of Steel for Difficult Service—W. S. Mounce . 55

DEPARTMENTS

The Reviewing Stand 4

Meeting Calendars 11, 13

Employment Service Bureau . . . 53

Published monthly by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio; Arthur E. Focke, President; Walter E. Jominy, Vice-President; William H. Eisenman, Secretary; Ralph L. Wilson, Treasurer; Thomas G. Digges, Elmer Gammeter, Fred J. Robbins, Harry P. Croft, Trustees; Harold K. Work, Past President. Subscriptions $5.00 per year ($6.00 foreign). Single copies $1.00. Entered as Second Class Matter, July 26, 1930, at the Post Office at Cleveland, Ohio, under the Act of March 3, 1879.

Speaker Cautions Against Use of Oversimplified Hardenability Test Data

Reported by W. T. Allison

Universal Cyclops Steel Corp.

"Hardenability Oversimplified" was the intriguing title of a lively talk presented by B. F. Shepherd, chief metallurgist of Ingersoll-Rand Co. and a past national president of A.S.M., before the Hartford Chapter at a recent meeting.

Mr. Shepherd cautioned users of carbon and alloy steels against depending upon oversimplified hardenability data, and pointed up the necessity for making actual hardening tests to determine the practical effects of mass, quenching media, and material variation on an individual heat of steel.

Technical proficiency is important in making any hardenability test. The speaker compared the P-V and other tests of hardenability, showing fields of application, and the relative merits of the tests as he saw them.

Mr. Shepherd's major contention is that simplified hardenability data should be used as a guide only, and not be substituted for a detailed metallurgical study. The latter is necessary because of the variables introduced by design of the part to be heat treated, and by the equipment available for processing.

A. H. d'Arcambal, vice-president and consulting metallurgist, Pratt & Whitney Div., Niles-Bement-Pond Co., acted as technical chairman and conducted an active discussion session following Mr. Shepherd's talk.

Metal Problem Solutions Based on Nuclear Physics

Reported by W. J. Fretague

Research Assistant, University of Notre Dame

How a metallurgist, using basic knowledge of nuclear physics, might attack perplexing and complex metallurgical problems was indicated in an enlightening talk before the Notre Dame Chapter A.S.M. on Oct. 12. Speaker was Bernard Waldman, associate professor of physics and director of the Notre Dame Nuclear Physics Laboratory.

Citing specific examples, Dr. Waldman explained how fundamental studies of diffusion, corrosion, oxidation, friction, annealing, recrystallization, carburization, nitriding and metallography can be adapted to the methods of nuclear physics by employing radioactive isotopes of the particular elements to be studied.

The applications are not confined to the field of fundamental research, however. Many problems concerned with process control are particularly adaptable to investigation by means of radioactive isotopes. Only two examples of many are the control of impurities in steelmaking, and investigations of slag-metal equilibria. Another field for radioactive isotopes is in chemical analysis.

Dr. Waldman highlighted his presentation with an actual demonstration of radioactivity. Using a portable source of neutrons (a metallic cartridge containing a mixture of beryllium and radium in a wax container), Dr. Waldman made an ordinary half dollar radioactive and measured the intensity of its radioactivity with a Geiger counter.

WE RETRACT—

with red-faced apologies the statement published in "Thirty Years Ago", December issue, to the effect that H. S. Rawdon had died recently. He is retired from the Bureau of Standards, but is still very much alive.

The Reviewing Stand

THE MODERN METHOD of specifying and purchasing steels by hardenability bands rated better than a full column (24 in. in all) in a recent issue of the New York *Times*. Presented in newspaper journalese, and embellished by the necessary layman slants, it nevertheless represented an accurate and fair account of the research behind the development, and compliments should go to Hartley W. Barclay, the *Times* reporter. Quoting from his story:

"The method of testing, known as the 'Jominy test', was originally developed by W. E. Jominy of the metallurgical department of General Motors Research Laboratories [and currently our own A.S.M. vice-president], according to Mr. Richardson [Ralph Richardson, manager, technical data section, Research Laboratories Division, General Motors Corp]. Mr. Jominy later became a staff engineer for Chrysler Corp.

"Much credit for providing an exchange of technical information with other metallurgists, from data developed by Mr. Jominy, must be given to the American Society for Metals in Cleveland, Mr. Richardson continued. Now the method of specifying steels according to hardenability standards is available to industrial buyers in plants of every description."

Credit was also given to A. L. Boegehold of General Motors Research Laboratories (a past president of A.S.M.), as well as to the Society of Automotive Engineers and the American Iron and Steel Institute, for the parts they played in the development of hardenability specifications.

Sugar Plums

The "visions of sugar plums" supposed to be dancing through the heads of most U.S. citizens last month didn't have much chance with the members of the A.S.M.-S.L.A. Literature Classification Committee. Their "sugar plums" were supplanted by visions of punch cards and codes—big holes and little holes, notches and slots, alphabets and numbers, mathematical computations and probabilities.

For, come Christmas or chaos, the committee was determined that its job would be finished so that the new classification system could be adopted in the February issue of *Metals Review* — which marks the beginning of a new annual volume of the A.S.M. Review of Metal Literature.

The new classification will follow pretty closely the same pattern as at present, and will not introduce any radical change in the system of classifying literature references mainly by processes and properties. A highly improved method of cross-indexing references by metals, alloys and materials, however, has been devised. The present numerical designation of section heads will be changed to an alphabetical code, and the entire field will be broken down into 20 divisions instead of the present 25. For instance, instead of the present Section 8 on Properties of Metals and Alloys, and Section 9 on Physical and Mechanical Testing, the new arrangement will substitute Section P on Physical Properties and Tests, and Section Q on Mechanical Properties and Tests.

Unfortunately, eager readers will have to wait a while before they can discover all of the unique features, the exhaustive detail, and the time-saving uses of this new classification. Even after the finishing touches are put on the system for adaptation in *Metals Review*, it will require a couple of months to get the entire project into book form and to have a supply of the accompanying punch cards printed. But when they are available, early in the spring, they should be worth waiting for.

M.R.H.

Joe Asbestos Studies Chemistry at 1600°C.

Reported by J. G. Cutton
Metallurgist
Carnegie-Illinois Steel Corp.

Marcus Grossmann (Left) Was an Honored Guest of the Mahoning Valley Chapter A.S.M. for the Presentation of the First Grossmann Memorial Lecture. Karl L. Fetters of Youngstown Sheet & Tube Co. (center) was the lecturer. At right is John W. Humphrey, general superintendent, Carnegie-Illinois Steel Corp., Youngstown District Works

Marcus A. Grossmann, past president A.S.M. and director of research, Carnegie-Illinois Steel Corp., was highly honored at the Mahoning Valley Chapter's meeting on Nov. 8 by the institution of the Grossmann Memorial Lecture. The first lecture was given by Karl L. Fetters, special metallurgical engineer of the Youngstown Sheet and Tube Co. Dr. Grossmann, a former Youngstowner, was present and spoke briefly.

Dr. Fetters spoke on "High-Temperature Chemistry" and introduced a character called Joe Asbestos, who was born and lives at temperatures of 1600° C. Joe studies chemistry and his chemistry is simple compared to that of the 23-degree chemist. Joe has no universal solvent like water, and is severely limited in tools for experimental studies; he must substitute reason for many of his measurements. Dr. Fetters told how the 23° chemist, using thermodynamics as propounded by Gibbs, and Lewis and Randall, is more able to explain Joe's chemistry.

Since the 23° chemist can't pick up and examine ions, atoms and molecules at 1600° C. nor even preserve their 1600° state, it is necessary to theorize to try to coordinate researches, continued Dr. Fetters. The role of oxygen in steelmaking is one paramount problem in openhearth practice. Getting the oxygen to the steel and through the slag blanket is essential. Study of mineralogy of slag has been useful, and in conjunction with the "slag pattie", tells what is happening at 1600° C.

Explaining thermodynamics as applied to deoxidation of steel, Dr. Fetters used the example of deoxidizing with carbon ($C + O = CO$). Careful studies have recently shown that the activity coefficient of oxygen is greatly affected by presence of carbon. Dr. Fetters explained that as carbon is added to deoxidize steel, the amount of oxygen in the bath not only decreases but also the activity of that oxygen remaining. This new concept goes far in explaining some observed facts in laboratories and steel plants. Similar work is in progress for other elements used in deoxidation of steel.

Dr. Fetters said that iron ore and coke for steelmaking are deteriorating in quality and that the utmost in technology is needed to make up for this deficiency.

In conclusion, the speaker stated that research in the field of thermodynamics at high temperatures is continuing so that eventually we may obtain a clearer picture of the chemistry problems confronting Joe Asbestos at 1600° C.

Tarasov Speaks at Washington

Leo P. Tarasov of the Norton Co. (Left) Converses With Thomas G. Digges, A.S.M. Trustee (Center), and Thomas E. Hamill, Washington Chapter Chairman, Following Dr. Tarasov's Lecture on "Metallurgical Aspects of Grinding" Given Before the Washington Chapter on Nov. 14 (Reported by Melvin R. Meyerson, National Bureau of Standards)

Mathematical Equations Applied to Formability

Reported by John B. Ross
Handy & Harman

"Metallurgical Principles Applied to the Formability of Metals" was the subject capably and understandably presented by John E. Dorn, professor of physical metallurgy, University of California, before the Los Angeles Chapter recently.

In support of these principles, Professor Dorn made extensive use of slides and discussed in detail such matters as common forming failures, effect of temperature on the modulus of elasticity of the elements, periodic variation of the modulus of elasticity, modulus of elasticity of Cu-Ni alloys, effect of various elements on the modulus of elasticity of alpha solid solution in magnesium and in aluminum.

Analyzing various tables and curves projected on the screen, the speaker showed how certain factors limit the formability of metals, such as elastic buckling, plastic buckling, local plastic deformation, and fractures.

During the question period, Professor Dorn chalked mathematical equations on the blackboard to work out problems submitted by local representatives of industry. The problem involving strain and stress in the forming of metals received particular attention.

Fatigue Tests Lead To Better Designs

Reported by D. W. Grobecker

Metallurgical Engineer
Los Alamos Scientific Laboratory

Speaking on "Fatigue Testing as Related to Design", Arthur F. Underwood of General Motors Corp. gave concrete examples of what can be done to extend the service life of machine parts subject to fatigue failure. Mr. Underwood addressed the November dinner meeting of the Los Alamos Chapter A.S.M.

Internal combustion engine connecting rods and bearings were cited as examples of the use of fatigue testing and the resulting improvements in design. Dynamic testing machines capable of producing alternating stresses of tension, compression, and torque have proven most applicable to gage the resistance of automotive parts to service failure. The more common physical tests such as tensile and impact loading are useful for material development, but are of little value for the determination of design factors.

Small changes in the design of connecting rods, such as changes in fillets, have greatly increased the resistance of the rods to fatigue failure. The value of shot peening or nitriding to retard service failure of connecting rods has been shown by fatigue tests.

A major cause of burned-out automotive bearings has been fatigue failure. Small tiles of the bearing surface were broken away in service. The irregular bearing surface caused the disruption of the oil film and the bearings burned out from the frictional heat developed. Fatigue tests showed that bearing life could be increased through using thinner bearing material or by using other alloys having greater resistance to fatigue failure.

Many Variables Affect Tool and Die Hardening

Reported by James Murray Hines

Sales Engineer, C. I. Hayes, Inc.

Many variables affect the heat treatment of tools and dies, Edward J. Pavesic, metallurgist of Lindberg Steel Treating Co., showed the Providence Chapter, speaking before its opening technical meeting on Nov. 2.

The successful heat treatment of tools and dies is dependent upon control of the raw material, its analysis and physical condition, proper design and control of the heat treating process, Mr. Pavesic pointed out.

The importance of starting with a fully annealed, 100% spheroidized toolsteel was illustrated with a series of slides depicting the microstructures of a 1% carbon header die steel in the annealed and hardened state. Use of controlled-atmosphere furnaces and neutral salt baths to eliminate carburization or decarburization was emphasized.

In describing heat treating techniques for tools and dies, the speaker included recommendations for preheating, and for control of heating rate, hardening temperature and time at the hardening temperature.

Dimensional changes in tools and dies are functions of mass, design and heat treating technique. Martempering or interrupted quenching above the Ms temperature results in greater growth than does oil quenching. Martempering or interrupted quenching will aid materially in the straightening of tools and dies of complex shape.

Corrosion Exposure Tests Show Striking Differences In Different Atmospheres

Reported by Arthur C. Willis

Instructor
Southern Methodist University

A group of colored slides portrayed vividly for the North Texas Chapter A.S.M. on Nov. 9 the difference in corrosion resistance afforded steel by various metal platings, in several thicknesses, and under widely different conditions of exposure. Speaker of the evening was C. H. Sample, assistant chemical engineer, nickel sales department, International Nickel Co. Mr. Sample is Chairman of A.S.T.M. Committee B-8 on Electrodeposited Metallic Coatings.

Plated steel specimens were subjected to different corrosive environments, including salt spray, humidity chamber, seashore, industrial and rural atmospheres. These specimens were in three groups: zinc or cadmium-plated, lead-plated (with or without underlying copper), and nickel, nickel-chromium or copper-nickel-chromium plated.

Two striking points were brought out. First was the lack of correlation between salt spray and atmospheric exposure tests, particularly in respect to zinc vs. cadmium plate, and nickel-chromium vs. copper-nickel-chromium coatings. Second, lead plate was found to be definitely superior to zinc plate of the same thickness in an industrial atmosphere, while zinc plate is far better than lead in a rural atmosphere.

Mr. Sample showed two slides of cast magnesium in which were inserted a number of steel and brass screws, several of them plated with different metals. While severe galvanic corrosion occurred in all cases under salt spray, relatively little corrosion was induced by gold plated screws in the humidity chamber, despite the very high electrochemical potential between gold and magnesium.

Titanium Said to Be One of Our Most Abundant Metals

Reported by Wilbur O. Manuel

Metallurgist, AC Spark Plug Division

Titanium is one of our most abundant metals, declared Bruce W. Gonser, supervisor of nonferrous metallurgical research at Battelle Memorial Institute, speaking before the Saginaw Valley Chapter A.S.M. on Oct. 11. It is contained in 98% of our igneous rocks, he continued, and some of the most promising ore bodies are in the Province of Quebec near Labrador.

Dr. Gonser used slides to illustrate the extraction of titanium, its physical properties and the properties of its alloys.

Extraction of the pure metal has been difficult because of its strong affinity for oxygen and nitrogen, which cause embrittlement. The wide use of titanium oxide in pigments, however, has stimulated research and progress in the preparation of commercially pure oxide.

The iodide process of extraction has produced the purest titanium to date, but it is very expensive because of the extremely small quantities produced so far. The reduction of titanium by magnesium has been developed more rapidly, and at present is the most practical method. The DuPont Company uses the latter process and is now producing about 100 lb. per day (which explains the present high cost of $5 per lb.).

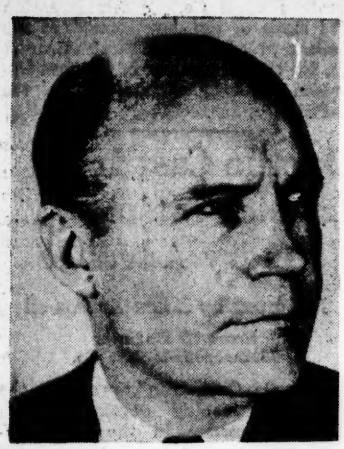
The consensus of people working with the extraction of titanium, according to Dr. Gonser, is that by improvements in the process and expansion of facilities, the cost probably will be reduced to $1 or $2 per lb. in the near future.

Titanium is now available for purchase as a powder, sponge, ingot or rolled sheet. It is light, has good resistance to corrosion, high strength, low expansivity and low thermal and conductivity properties.

The future of titanium is in its alloys, Dr. Gonser explained. It reacts with practically all metals, and much research is being done in this field. Applications are limited at present, but the Government is rapidly developing uses for titanium and its alloys in military products.

The meeting was designated as "Past Chairmen's Night", and served to honor the following members (listed in sequence, starting with 1936-37 and ending with 1948-49): A. G. Spencer, R. J. Griffin, R. B. Schenck, C. M. Campbell, A. W. Winston, H. S. Austin, M. A. Grobe, W. F. Marande, H. W. Schmidt, E. R. Wilson, A. H. Karpicke, M. J. Caserio, and H. A. Maloney

Joins Nickel Company



Francis B. Foley, A.S.M. Past National President, and Past Chairman of the Philadelphia Chapter, Has Joined the Staff of the International Nickel Co. Research Laboratory at Bayonne, N.J., as Metallurgical Consultant. Mr. Foley had been chief research engineer of the Midvale Co., Philadelphia, since 1926. Although he had originally joined Midvale in 1905, he was away from the company for a ten-year interval between 1917 and 1926. During that period he taught metallography at University of Minnesota, did war and postwar work at the Bureau of Mines, and served as metallurgist for the Lucey Mfg. Corp., Chattanooga

Machinability Test Leads to Improved Heat Treatment

Reported by A. H. Rauch

Metallurgist, Deere and Co.

A subject of continuing interest to metallurgists and tool engineers was presented before the Tri-City Chapter A.S.M. on Nov. 8. This was "The Composition and Structure of Steels in Preparation for Machining", presented by G. C. Riegel, chief metallurgist, Caterpillar Tractor Co.

Mr. Riegel described a machinability test which forms the basis for determining the optimum structure and heat treatment for each grade of steel used at the Caterpillar plant. It also led to the installation of atmosphere-controlled continuous annealing furnaces.

The test consists of determining the breakdown time of a standard lathe bit (described originally by Brophy) when machining 3½-in. diameter by 24-in. test logs, without coolant, at constant speeds and feeds. The breakdown of the tool, determined by visual inspection of the tip, occurs suddenly.

The 20 alloy steels once employed at Caterpillar have been reduced in number to seven—all of the 8600 series. Five plain carbon steels are being used—two low carbon and three medium carbon. Mr. Riegel showed slides illustrating the structure, treatment and machinability test results for representative types.

On 1018 steel a normalizing treatment was found to eliminate blocky ferrite and minimize the formation of a built-up edge on the tool. S.A.E. 1026 steel showed best machinability in the as-forged condition. The treatment given 1040 steel depends upon the method of cooling after forging. The forgings are normalized except when cooled at a controlled rate after forging by the supplier. The normalized structure is preferred where broaching and serrating are concerned, but annealing is superior where turning is the only operation.

For the alloy grades an isothermal annealing treatment generally shows best results in the machinability tests. In addition to the increased tool life and better finish, the isothermal treatment takes less time than the conventional annealing method of slow cooling.

Mr. Riegel recognized the fact that no one structure is best for all methods of machining. The optimum structure for each method of metal removal must be determined by trial. The structure selected for each type of steel should be the one most suitable for that machining operation which causes the most difficulty in the shop.

Focke's New York Visit Features Radio-Isotopes

Reported by Fred Heinzelman, Jr.

Fred Heinzelman & Sons

"National Officers' Night" inaugurated the monthly technical sessions for the New York Chapter A.S.M. on Nov. 14. Not only National President A. E. Focke and Secretary Bill Eisenman, but also Past President H. K. Work, honored the occasion.

Dr. Focke presented his talk on "Radio-Isotopes in Metallurgy" in a novel and unusual manner, which a census later proved an excellent method of presentation.

A lively discussion was led by E. P. Polushkin, consulting engineer, and V. N. Krivobok, who, in the early 1920's, first experimented with the effects of uranium in steels.

President Talks on Wear

Reported by E. K. Spring

Chief Metallurgist
Henry Disston & Sons, Inc.

Various types of wear and methods of evaluating them were dealt with most ably by President Arthur E. Focke at National Officers' Night of the Philadelphia Chapter A.S.M. on Nov. 25. National Secretary Eisenman was the second honored guest and speaker.

Dr. Focke used a new approach to the presentation of technical papers, and a poll of the audience disclosed a nearly unanimous approval of the method. The possibility of audience participation stimulates the interest of the listeners and assists in keeping the audience on their toes.

Turn about being fair play, Dr. Focke was made the guinea pig in a trial recording of his entire speech—the first of a series of recordings of chapter addresses.

Speaks at Kansas City

P. G. DeHuff (Center), of the Aviation Gas Turbine Division of Westinghouse Electric Corp., Was the Principal Speaker at the October Meeting of the Kansas City Chapter. Left is LeRoy Campbell, chairman of the entertainment committee, and (right) Frank Trimble, chapter vice-chairman

Application of Welding to Local Products Described at Los Angeles Joint Meeting

Local Leaders of A.S.M. and A.W.S. Are Shown at a Joint Meeting of the Los Angeles Chapters of the Two Groups. Left to right are C. T. Sweitzer, vice-chairman of A.W.S.; W. A. Saylor, also of the Welding Society; J. B. Morey, chairman of A.S.M., and H. W. Heimke, principal speaker

Reported by Ben Gray

Gray Engineering Co.

Welding plays an important role in the manufacture of local products, as outlined by Hugo Heimke, consulting engineer, in addressing a joint meeting of the Los Angeles Chapters of American Society for Metals and American Welding Society on Nov. 17.

Mr. Heimke showed photographs of some interesting products manufactured in this area, and explained the welding methods and techniques that applied to each. A partial list includes atomic hydrogen welding of die steels; submerged melt welding in the production of high-tensile pipe; carbon-arc welding of water heater tanks; flash welding of drill pipe; spot welding stainless liners and aluminum aircraft wing structures; automatic hard facing on construction equipment; and flame hardening of railroad engine parts and pump plungers.

Field erection of the world's largest catalytic cracking unit was illustrated, as well as the development of the tandem-arc submerged-melt welding process used in the production of large diameter pipe at Consolidated Western Steel Co. Special mention was made of the development of the Heliarc process by Northrop Aircraft Co. for the fabrication of the first all-welded all-magnesium plane, the X-P56.

Indianapolis Chapter Honors Native Son

Reported by S. A. Minton, Jr.

Allison Division, G.M.C.

On Nov. 21, 182 members and friends of the Indianapolis Chapter A.S.M. gathered to honor National President Arthur E. Focke. Members from Lafayette and Kokomo were among those present for the dinner.

After Secretary Bill Eisenman's short talk on the present status of the Society, Dr. Focke was introduced as the guest of honor by Guy M. Wainwright, president of Diamond Chain Co., Inc. Dr. Focke's talk on "Wear and Wear Testing" was presented in the unusual audience-participation manner. As in his past experience, it was well received by the Indianapolis audience.

To conclude the evening activities, John Watson, chapter chairman, presented Dr. Focke with a gold pocket watch from the Indianapolis Chapter in honor of the election of its native son to the national presidency.

Arthur E. Focke (Left), A.S.M. National President, Presented the Principal Address Before His Home Chapter in Indianapolis on Nov. 21. At right is Guy M. Wainwright, president of Diamond Chain Co., Inc.

Ductile Cast Iron Labeled Major Foundry Advance

Reported by Knox A. Powell

Research Engineer
Minneapolis-Moline Co.

"Ductile Cast Iron", probably the most far-reaching development in foundry practice in the last half-century, was the subject presented before the November dinner meeting of the Northwest Chapter A.S.M., held jointly with the Twin City Chapter A.F.S. Jack C. Neemes of the International Nickel Development and Research Division followed his talk by a series of slides showing ductile iron castings and casting practice, and the microstructures produced by various compositions and heat treatment.

Mr. Neemes pointed out that the addition of magnesium alloy, so that a minimum amount of about 0.05% will remain in the iron, causes the graphite to form in spheroids instead of in flakes. This confers much of the ductility of malleable iron with even greater strength as-cast, and the additional ability to respond to heat treatment.

Spheroidal cast iron, said Mr. Neemes, has a low melting temperature and high fluidity, and is easily cast. The dimensional shrinkage is practically the same as cast iron, although the contraction at freezing is somewhat greater than that of cast iron, requiring modified gating and risering. Spheroidal cast iron is less susceptible to variety and change of section thickness than cast iron, and shrinkage defects are rarely hidden but almost always show up as a collapse at the surface or as a telltale at the gate and riser necks.

Spheroidal cast iron is readily machined, said Mr. Neemes, even at hardnesses higher than the normal range common to the general run of flake irons. The strength tends to increase with carbon up to the highest percentages in cupola iron. Silicon from 2.25 to 2.75% is the normal range found in ductile iron castings. The grain tends to be fine and dense.

Tensile strengths of 80,000 to 100,000 psi., with 60,000 to 75,000 psi. yield strength and 1.5% to 10% elongation, are produced as-cast, depending on chemistry of the base iron. Annealing produces approximately 70,000 psi. tensile and 50,000 psi. yield with 15 to 22% elongation when austenitized at 1600 to 1700°F., cooled to 1275 to 1300°F., and held for 4 hr.

"Quality Steel" Cannot Substitute for Improper Design, McQuaid Says

Reported by Robert D. Wylie

Babcock & Wilcox Co.

"Quality steel", according to Harry W. McQuaid, nationally known metallurgical consultant of Cleveland, is the cheapest steel that will do a satisfactory and economical job. Mr. McQuaid addressed the second meeting of the current season for the Akron Chapter A.S.M.

In the first part of his talk he elaborated upon this definition of quality steels, and in the second answered the question "How are quality steels produced?" Interspersed throughout his lecture were references to many of the economic aspects of steelmaking which were unfamiliar to the members of the audience.

Companies often develop rigid specifications for quality involving high-cost special analyses, physical tests, and nonmetallic inclusion tests for steels in an application where failures have occurred because of faulty design or processing. In fact, Mr. McQuaid said, quality steels are sometimes merely a "figment of the imagination" of an engineer or designer trying to put across a poor design.

One company spent thousands of dollars procuring special-quality steels for a gear application to prevent failure of the teeth, when the final solution lay in surface treatment of the gear teeth. Quality for this job meant not high-priced steels but correct analysis of operating difficulties and gear failures.

Often the need is not for "quality" steels but for quality metallurgists and engineers!

Proper analysis of failures, selection of steel (including hardenability), heat treatment, fabrication, and cost are prime factors in determining the quality of steels.

Many times, however, "quality steels" are necessary for a particular job, and problems may occur in their production. A quality rimmed-steel ingot is entirely different from a quality killed-steel ingot, and a fully killed low-oxygen steel is not always best for a certain application. Many important factors are involved in producing steels of closely controlled chemistry, low sulphur and phosphorus contents, and low nonmetallic inclusion count as well as freedom from flaws. The speaker particularly stressed bath temperature, amount of agitation, and fluidity and basicity of the slag, as well as the time necessary for the reactions to occur. In the production of finished steel, the size of the ingot, ingot practice (removal of flaws), and proper control of rolling temperature are extremely important.

In conclusion, Mr. McQuaid pointed out some of the economics of steelmaking. Obsolete equipment, keen competition, high freight cost, and high labor rates will be important in the future, and he predicted a trend toward decentralization of steel-producing units for economy.

Principles Behind Use of Furnace Atmospheres in Heat Treating Explained

Reported by D. J. Girardi

Metallurgist, Timken Steel and Tube Division

Canton-Massillon Chapter A.S.M. spent an enjoyable and enlightening evening honoring its secretary, L. A. Zeitz, industrial engineer, East Ohio Gas Co., and listening to E. G. de Coriolis, director of research for the Surface Combustion Co., speak on "Furnace Atmospheres in Heat Treating".

Mr. Zeitz has completed ten years of continuous service as secretary of the chapter, and the members expressed their gratitude by presenting him with a piece of luggage.

Pointing out that the application of furnace atmospheres in the heat treatment of metals (both ferrous and nonferrous) is one of the important developments in the field of heat treating, Mr. de Coriolis presented the historical background, present status and future trends.

After explaining the origin of the symbols DX, NX, and others used to designate the present commercially important prepared atmospheres, Mr. de Coriolis discussed the composition of each and reviewed the effect of the individual gas constituents on steel at heat treating temperatures.

Slides of schematic drawing and pictures of actual equipment were employed in discussing principles and operating details, such as air-gas proportioning control, cracking a non-combustible mixture of gas and air in contact with a catalyst at high temperature, chemical absorption of carbon dioxide, and dehydration, involved in the production of the various atmospheres.

Special emphasis was placed on the theory behind the concept of a specific atmosphere composition giving a definite carbon potential at a given temperature and the measurement of this "carbon potential" by the dew point of the gas. Mr. de Coriolis then reviewed the application of this principle to carbon restoration.

Terwell Represents Rolock

Elmer A. Terwell, formerly sales engineer for Driver-Harris Co., Chicago, and previously associated with the Salkover Metal Processing Co., is now representing Rolock Inc., Fairfield, Conn., throughout northern Illinois and southern Wisconsin. Mr. Terwell was secretary of the Chicago Chapter A.S.M. in 1938-1942.

Ingenious Method Used to Evaluate Hot Workability

Reported by D. B. Graves

Federated Metals Division
American Smelting & Refining Co.

An ingenious method for determining the hot workability of a steel was portrayed to the Calumet Chapter A.S.M. on Nov. 8 by Harry K. Ihrig, vice-president, Globe Steel Tubes Co. The hot twist test was developed at Globe Steel Tubes to help determine the susceptibility of high-alloy and stainless steels to hot working, and has become invaluable in the manufacture of steel tubes.

A ⅞-in. test bar is heated to the desired temperature by an electric furnace. It is then held in a chuck and twisted at 128 r.p.m. until the bar breaks. A counter records the number of turns produced on the bar. For any given heat the number of turns before breaking increases as the temperature goes up, until the blue brittle range is reached, when there is a drop in the number of revolutions. Above this range the number of turns again increases.

The test tells effectively whether a heat of steel can be hot worked and at what temperature, since there is a marked difference in the number of turns between a steel that has good and one that has poor hot working characteristics. A steel surviving 50 turns or more will have good hot workability, 40 turns and below will not be very economical in production, and 30 turns and below is very poor.

Any single heat is reproducible within a few turns. The big mystery seems to be the variation in hot working properties of different heats of steel of the same chemical analysis.

Two elements, nickel and manganese, will increase the hot workability of steel. Chromium above 9% has a similar effect. Tin, lead, sulphur, nitrogen, and columbium decrease hot workability, while the effect of carbon, silicon, molybdenum, titanium, and phosphorus is slight.

Talks on Stainless Steel

Reported by Arthur C. Willis

Instructor
Southern Methodist University

Speaker at the regular meeting of the North Texas Chapter A. S. M. on Nov. 30 was W. B. Pierce, manager of the sales development department, Allegheny Ludlum Steel Corp. Mr. Pierce was accompanied by Mr. Lewis and Mr. Van Deventer of Allegheny Ludlum's Houston office.

His subject was "Fabrication and Uses of Stainless Steel". The talk was brief but to the point.

Powder Metallurgy at Crossroads

Left to Right at the November Meeting of the Springfield Chapter A.S.M. Are W. S. Beecher, Vice-Chairman; Prof. C. G. Johnson of Worcester Polytech. Principal Speaker; J. A. Tinsman, Chapter Chairman; and Prof. George Marston of University of Massachusetts, Coffee Speaker

Reported by Howard E. Boyer

Chief Metallurgist
American Bosch Corp.

Metallurgical and design aspects of part fabrication from metal powder were discussed by Prof. Carl G. Johnson, vice-president of the Presmet Corp., and prominent member of the faculty at Worcester Polytechnic Institute, at the November meeting of the Springfield Chapter A.S.M.

In the light of the historical background, Professor Johnson discussed the gradual evolution which has brought metal powder fabrication to its present eminence. This relatively new method of fabrication has seemingly arrived at a "crossroad", he stated, and there is some question as to whether or not its advancement will be rapid in the future. General indications are, however, that the industrial demand will continue to increase.

Professor Johnson illustrated his lecture with slides and a sizable display of metal powder parts. A multiplicity of alloys can be produced by this method, he said, although the compositions containing copper as the principal element comprise the major portion of today's production.

The various methods of producing metal powders were described. Thorough mixing of the powders prior to pressing is especially necessary, the professor pointed out. The basic process of mixing, pressing and sintering can be supplemented by modifications which incorporate pre-sintering and coining or double pressing operations. Little has been accomplished along the line of hot pressing.

Professor Johnson stated that it might be possible to approach the density of forgings or castings by the metal powder process without resorting to some form of impregnations, but it would be highly impractical when using the three-step process of mixing, pressing and sintering.

The talk also included a discussion of design and its influence on part fabrication from powdered metal. Certain designs will lend themselves readily to this process, while other parts are difficult or impossible to make from metal powder. The problems involved in tooling were also emphasized.

Physical and Chemical Factors Interrelated in Machinability Studies

Reported by F. R. Morral

Syracuse University

Physical and chemical factors which explain "Machinability" in a quantitative manner were discussed by R. C. Gibbons of Eclipse Pioneer Division of Bendix Aviation Corp., in an address before the Syracuse Chapter A.S.M. on Nov. 1.

Chemical composition affects microstructure, and microstructure is closely related to physical properties. In evaluating machinability, ductility of the material is more critical than hardness in annealed steels. Impact tensile data and transverse data may be useful, since machining is essentially a high-speed operation.

The effect of heat treatment on structures and their machinability was illustrated, using practical alloy steel problems. Cycle annealing is coming into greater use. Mixed structures are often undesirable because one of the constituents may be too hard to machine, and will cause rapid wear of the tools. Grain size usually makes little difference.

Ductile structures are undesirable but can be improved by cold working or adding homogeneous layers of a harder, more brittle material (such as sulphides or pearlite). Lamellar pearlite is best in steels containing less than 0.45% carbon, while above 0.6% carbon, a spheroidized structure is preferable. These ranges may vary somewhat, depending upon the finish wanted and the type of machining used (grinding, broaching, or other).

Advantages of Carbonitriding Process Are Enticing to Automotive Audience

Reported by H. H. Benninger

Peninsular Steel Co.

The topic of "Carbonitriding", presented before the November meeting of the Detroit Chapter A.S.M., proved to be of more than passing interest to metallurgists associated with the automotive industry. The speaker, Michael B. Bever of Massachusetts Institute of Technology, therefore addressed a capacity audience.

The physical characteristics of a carbonitrided part can be controlled primarily through time and temperature relationships, according to observations made by Dr. Bever and his associates. Quite wide variations in gas analysis, including percentage of methane (or other carburizing gas) ammonia, carrier gas, and even water vapor are possible, while still producing acceptable hardened parts.

To the materials engineer, this process offers a fertile field for study. Through use of the treatment, ordinary carbon steels can be oil quenched to surface hardnesses normally obtainable only by water quenching. In addition to this advantage, industrial experience indicates that carbonitrided cases may be more wear resistant than ordinary carburized cases. And —of greatest moment—all of these benefits are obtainable at less cost than the commonly used surface hard ening techniques.

The dinner meeting which preceded the lecture period was highlighted by a coffee talk by Paul T. Shine, assistant head of the Federal Bureau of Investigation in this area.

Michael B. Bever

New Magnaflux Test Methods Increase Precision, Speed

Reported by G. W. Birdsall

Reynolds Metals Co.

A new method of testing, called "Partek", for unfired porous ceramic materials and powdered metal compacts is now available, according to Kermit Skeie, field engineer of the Magnaflux Corp. Mr. Skeie addressed the November meeting of the Louisville Chapter A.S.M. on "Recent Developments in Nondestructive Testing".

"Statiflux" is another recently developed test that is applicable to the location of minute cracks and pinholes in nonconductors. In this method, finely divided carbonate particles are blown through a special nozzle which imparts an electrostatic charge to the surface of these particles. It is so sensitive that it will reveal cracks that cannot successfully be located with an electron microscope—cracks as narrow as 10 microns in width.

New developments in magnaflux testing are broadening its range of application and speed of operation. In order to show up a defect or discontinuity, the defect must cut the magnetic lines of force induced in the workpiece. That means that it has been necessary in the past to magnetize the work in different directions, testing in each direction for flaws. This, of course, involves the problem of time, and, where a complicated piece requires magnetizing in several different directions, adds appreciably to the cost of the inspection operation.

Now, a new method of magnetizing in all directions at once has been developed to speed up testing and to detect all types of flaws. In one "Duovec" setup, the work can be magnetized circularly by passing a current through it from one end to the other; at the same time a coil magnetization is applied to induce a varying longitudinal magnetic field in the work. Each field can be adjusted individually to balance results for particular shapes, and both fields are applied at once, or in subsequent half cycles of rectified current. The resultant combination of magnetizing forces has been found equivalent to magnetizing the work in all directions and reveals flaws immediately which would formerly require magnetization and testing in several separate and individual operations.

Whereas certain parts formerly required up to 11 separate and different magnetizations, the new Duovec system does the job all at one step. The simplification and cost reduction possible are self-evident. A reduction of two-thirds the manhours formerly required is obtainable on even the most simple jobs.

Technical Papers Invited

The Publications Committee of the A.S.M. will now receive technical papers for consideration for publication in the 1951 *Transactions*. A cordial invitation is extended to all members and nonmembers of the A.S.M. to submit technical papers to the society. Many of the papers approved by the committee will be scheduled for presentation on the technical program of the 32nd National Metal Congress and Exposition to be held in Chicago, Oct. 23 to 27, 1950. Papers that are selected for presentation at the Convention will be preprinted and manuscripts should be received at A.S.M. headquarters office not later than April 15, 1950.

Manuscripts in triplicate, plus one set of unmounted photographs and original tracings, should be sent to the attention of Ray T. Bayless, assistant secretary, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

Headquarters should be notified of your intention to submit a paper, and helpful suggestions for the preparation of technical papers will be sent.

Generalizes on Effects of Alloying Elements in Steel

Reported by Robert L. Needham

Metallurgical Engineer
Delco Products Div., G.M.C.

"The Function of the Alloying Elements in Steel" was presented by John M. Hodge of Carnegie-Illinois Steel Corp. before the Dayton Chapter A.S.M. on Nov. 9. Mr. Hodge, who holds the position of "research associate—heat treating and alloy steels", did not single out each alloying element and describe its specific effects, but rather approached the subject from the viewpoint of "What do alloying elements in general do?"

His points were profusely illustrated with well-prepared slides, starting with the familiar isothermal time-temperature-transformation curves for plain carbon eutectoid steel, and then showing the effects of alloying from this point.

Alloys are nearly always added for the control of microstructure, Mr. Hodge pointed out. He then proceded to show how microstructure is controlled by alloys, relations between microstructure and some physical properties, and practical aspects of continuous cooling transformations.

He concluded with a few examples in which alloys are added for reasons other than the control of microstructure. Some of these are the addition of silicon for electrical sheet, cobalt in permanent magnet materials, chromium and nickel in 18-8 stainless, and manganese in Hadfield steel to inhibit phase changes.

Quality Control a Must In Aluminum Industry

Reported by E. R. Freeman

Kaiser Aluminum & Chemical Corp.

"Quality control is a must in the aluminum industry", said V. F. Binkley, staff metallurgist of the Kaiser Aluminum & Chemical Corp., in his talk to the members and visitors of the Inland Empire Chapter A.S.M. on Nov. 29. Mr. Binkley stressed rigid control of annealing temperatures and rolling practices as a step in quality control.

Control of finish was illustrated by many examples of first-class refrigerator doors, while examples of various deep drawing operations proved the availability of non-earing sheet.

Following Mr. Binkley's talk, M. R. Writt, Jr., metallurgist, spoke briefly on "Semi-finished Sheet Products". Several new machines have been placed into operation recently, and among these the embossing machine seemed to stimulate the most interest. This machine embosses the metal as coil or flat sheet. Embossed corrugated roofing sheet is stronger and reflectivity is cut down, Mr. Writt pointed out.

The evening program was then highlighted by a conducted tour of the Kaiser Aluminum & Chemical Corp.'s research laboratory and rolling mill, where the A.S.M. members and visitors saw aluminum in the making. By this actual demonstration, they learned how the fiery-hot molten metal is poured into 5000-lb. ingots and then rolled to cardboard thinness.

IMPORTANT MEETINGS

for February

Feb. 7—Society for Applied Spectroscopy. Socony Vacuum Training Center, 63 Park Row, New York City. (Rodger W. Loofbourow, chemical control division, Merck & Co., Inc., Rahway, N. J.)

Feb. 12-16—American Institute of Mining and Metallurgical Engineers. Annual Meeting, Statler Hotel, New York. (Ernest Kirkendall, secretary, Metals Branch, A.I.M.E., 29 West 39th St., New York 18.)

Feb. 27-March 3— American Society for Testing Materials. Committee Week and Spring Meeting, Hotel William Penn, Pittsburgh. (R. J. Painter, assistant secretary, A.S.T.M., 1916 Race St., Philadelphia 3.)

Jeffries Retires As Vice-President Of General Electric

Zay Jeffries, prominent metallurgist, scientist and industrialist, retired on Dec. 31 as vice-president of General Electric Co. in charge of the chemical department.

Dr. Jeffries is an honorary member and past president (1929) of the American Society for Metals. He was also treasurer of the society for four years and has served on the national finance committee continuously since 1928. He was the first recipient of the society's Gold Medal, its highest honor, and has also been awarded the Albert Sauveur Achievement Medal by the A.S.M.

Zay Jeffries

Honors from the Government and other organizations include the Medal of Merit for services with the War Metallurgy Committee, the John Fritz Medal, the James Douglas Medal of the American Institute of Mining and Metallurgical Engineers, the Clamer Medal of the Franklin Institute, and the Powder Metallurgy Medal of Stevens Institute of Technology.

Dr. Jeffries began service with General Electric in 1914 as consultant to the National Lamp Works, after several years on the faculty of Case Institute of Technology. In 1915 he became director of research for Aluminum Castings Co. and later was consulting metallurgical engineer for Aluminum Co. of America. It was during these years that the famed text on "The Science of Metals" by Jeffries and Archer was published. R. S. Archer, Dr. Jeffries' collaborator at the Aluminum Co., is also a past president of A.S.M.

From 1932 to 1936 he was president of Carboloy Co., Inc., a G. E. affiliate, and in 1936 became technical director of the lamp department. In January 1945 he was elected a vice-president and placed in charge of the newly formed chemical department. He has also been a member of General Electric's four-man committee which administers all of the work on atomic energy being conducted for the Government.

During the war Dr. Jeffries was vice-chairman of the War Metallurgy Committee and chairman of two of its subcommittees. He also served as a consultant for the University of Chicago metallurgical laboratory, part of the Manhattan Project.

He received his B. S. degree, metallurgical engineer degree, and honorary doctor's degree from South Dakota State School of Mines. He received his doctor of science degree from Harvard University, and also has an honorary D. Sc. from Case Institute of Technology.

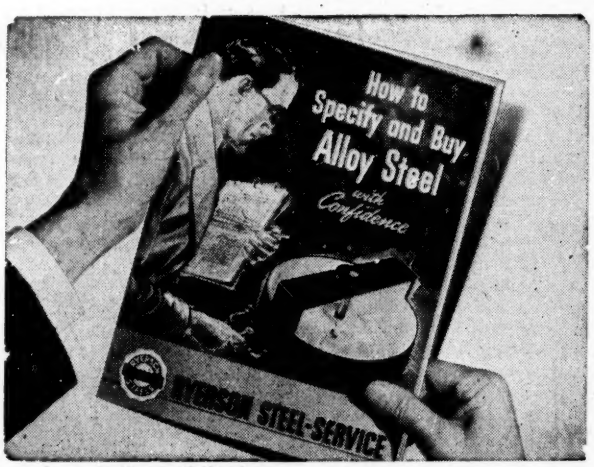
Fundamentals of Carbide Tool Design Explained

Some fundamental factors in carbide tool design were explained by W. T. Muirhead, managing director, A. C. Wickman (Canada) Ltd., at a meeting of the Ottawa Valley Chapter A.S.M. on Nov. 8.

The high wear resistance of tungsten carbide gives it certain advantages over steel for making gages. By using tungsten carbide cutting tools, one man on one machine has been able to produce as much as three machines with three operators. Dies for slitting expanded steel lath have been known to operate for nine months, 8 hr. per day, making 500 cuts per minute, without regrinding.

After great effort and expense, rock drill bits have been developed which have a longer life than steel in drilling the hard rock formation found in Canadian mines.

The discussion period which followed the lecture was conducted by S. L. Gertsman, technical chairman.



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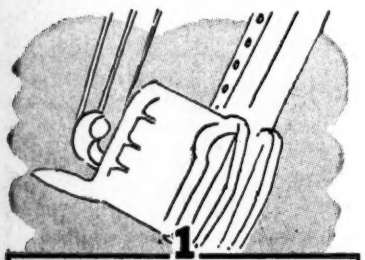
CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Akron	Feb. 8	University Club	T. Keith Glennan	Sustaining Members' Night
Baltimore	Feb. 20	Crown Cork & Seal Co.	Charles Glock	Plant Visitation
Boston	Feb. 3		A. E. Focke	National Officers' Night
Calumet	Feb. 14	Phil Smidt & Son, Whiting, Ind.	R. E. Zimmerman	Economics of the Steel Industry
Canton-Massillon	Feb. 13		Peter Payson	Tool and Die Steels
Chicago	Feb. 13	Furniture Mart Bldg.	Paul Mundie	The Woman Behind the Man Behind the Desk
Cincinnati	Feb. 9	Engineering Society	John W. Sands	Effects of Nickel in Steel
Cleveland	Feb. 6	Tudor Arms Hotel	H. C. Cross	Manufacture and Properties of Titanium
Columbus	Feb. 14	Fort Hayes Hotel	N. E. Promisel	Looking Ahead in Aircraft Materials
Dayton	Jan. 11	Engineers Club	Howard Cross	Titanium and Titanium Alloys
Detroit	Feb. 13	Rackham Bldg.	A. E. Focke	National Officers' Night
Fort Wayne	Feb. 13	Chamber of Commerce		Grinding Cracks, Causes, and Methods of Prevention
Hartford	Feb. 14	The Hedges	H. E. Van Valkenburg	Ultrasonic Reflectoscope
Indianapolis	Feb. 20	McClarney's Restaurant	V. N. Krivobok	New Developments in Stainless Steels
Los Alamos	Feb. 20	Civic Club / H. S. Little Theatre	R. C. Smith	The Engineer—The Literature and Patent Law
Los Angeles	Feb. 10	Roger Young Audit.	Gosta Vennerholm	Cast Products From the Metallurgical Viewpoint
Louisville	Feb. 7		Glen Riegel	Preparation and Use of Specifications
Mahoning Valley	Feb. 14	V.F.W. Hall	Wade R. Weaver	Quality Control of Production Processes
Milwaukee	Feb. 21	City Club	Carl Zapffe	Fabrication and Application of Stainless Steels
Montreal	Feb. 6	Queens Hotel		Symposium on Protective Coatings
Muncie	Feb. 14	Muncie Central High School	A. E. Focke	Mechanical Testing
New Haven	Feb. 16	Hotel Barnum, Bridgeport, Conn.	N. J. Grant	Jet Propulsion Metallurgy
New Jersey	Feb. 20	Essex House, Newark	K. H. Barnes	Effect of Shot Peening on the Fatigue of Metals
New York	Feb. 20	Building Trades Club		Panel Discussion on Powder Metallurgy
North Texas	Feb. 15	Fort Worth	A. F. Holden	Salt Bath Brazing
North West	Feb. 14	Minneapolis Athletic Club		Valentine Party
Northwest Pa.	Feb. 24	Meadville, Pa.	R. D. Gordon	Precision Casting Development
Notre Dame	Feb. 8	Engineering Auditorium	A. R. Troiano	Transformation and Hardenability of Alloy Steels
Oak Ridge	Feb. 15		C. G. Harmon	High-Temperature Furnaces
Ontario	Feb. 3	Royal Connaught Hotel, Hamilton	O. K. Hill	Springs
Ottawa Valley	Feb. 7	Bur. of Mines	B. Chalmers	Solidification of Metals
Philadelphia	Feb. 24	Engineers Club	L. F. Livingston	Preview of Progress
Pittsburgh	Feb. 9	Roosevelt Hotel	E. P. Best, F. L. Toy, A. B. Wilder	Bessemer Steel Making
Puget Sound	Feb. 15	Leopold Hotel, Bellingham		Plant Visitation to Puget Sound Pulp & Paper Co.
Purdue	Feb. 21	Purdue Union	H. J. Yearian, R. B. Mears, F. L. LaQue	Corrosion Symposium
Rhode Island	Feb. 1		Henry Stroh	Practical Aspects of Plating
Rochester	Feb. 6	Chamber of Commerce		Titanium
Rockford	Feb. 22	Faust Hotel	R. H. Aborn	Martensite and Martempering
Rocky Mountain	Feb. 16	Pueblo		Ladies' Night
	Feb. 17	Denver		Student Night
Saginaw Valley	Feb. 21	Fischer's Hotel, Frankenmuth	Don Francisco	Silicones and Their Applications in the Metal Industries
St. Louis	Feb. 17	Forest Park Hotel	V. N. Krivobok	Stainless Steel
Syracuse	Feb. 7	Onondaga Hotel	G. L. Cox	Ductile Cast Iron
Terre Haute	Feb. 6		A. E. Focke	National Officers' Night
Texas	Feb. 7			
Toledo	Feb. 23		Francis G. Tatnall	Stress Analysis
Tri-City	Feb. 14			Plant Visitation
Utah	Feb. 23	Newhouse	J. C. Hurst	Finished Brass Products
Warren	Feb. 9	El Rio Restaurant	Ralph L. Wilson	Development of High-Temperature Steels, Historically
Washington	Feb. 10		Morris Cohen	Hardening and Tempering of Steel
West Michigan	Feb. 20			Panel Discussion
Western Ont.	Feb. 10	Cobblestone Inn, London, Ont.	F. Bain	Stainless Steels
Worcester	Feb. 1	Aurora Hotel	A. E. Focke	Sustaining Members' Night
York	Feb. 8			

A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received During the Past Month

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio
W. W. Howell, Technical Abstractor



1 ORE BENEFICIATION and RESERVES

1A—General

1A-61. Floatability of Minerals. F. T. C. Doughty. *Mining Magazine*, v. 81, Nov. 1949, p. 268-271.

General mineral characteristics of common metallic and nonmetallic minerals.

1A-62. Impressions Gained During a Recent Metallurgical Tour of the North American Continent. O. A. E. Jackson. *Journal of the Chemical, Metallurgical & Mining Society of South Africa*, v. 50, Aug. 1949, p. 21-33; discussion, p. 33-40.

Procedures and equipment of some two dozen ore mining and beneficiation plants in the U. S., Canada, and Mexico; compares practice with that of the Witwatersrand in South Africa.

1A-63. Die Aufbereitung der Rammelsberger Erze. (Beneficiation of Rammelsberger Ore.) E. Kraume. *Zeitschrift für Erzebergbau und Metallhüttenwesen*, v. 2, Sept. 1949, p. 257-263; Oct. 1949, p. 303-309.

Triple-step flotation process which separates the finely ground ore into Pb, Zn, and Fe concentrates. Problems still awaiting solution.

1A-64. Schwimm- und Sinkaufbereitung für Erze. (Float-Sink Beneficiation of Ores.) Herbert Sommerlatte. *Zeitschrift für Erzebergbau und Metallhüttenwesen*, v. 2, Sept. 1949, p. 268-274; Oct. 1949, p. 296-299.

Equipment and procedure. Operating data and prospects for future development.

1A-65. A New Theory of the Ball Mill and Some of Its Applications. (In Russian.) N. P. Neronov. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), July 1949, p. 1067-1084.

Basic equations of a new theory of ball milling. These equations are interpreted graphically, permitting rapid determination of optimum conditions of operation.

1B—Ferrous

1B-66. Taconite Beneficiation Plants. *Iron and Steel Engineer*, v. 26, Nov. 1949, p. 109-110.

Proposed plants of Erie Mining Co. to be located on the Mesabi range.

1B-67. Iron Ore: Its Mining, Beneficiation and Reserves. Parts I-III. E. W. Davis. *Steel*, v. 125, Nov. 21, 1949, p. 96, 99, 102, 105, 108, 111-112; Nov. 28, 1949, p. 78, 81-82, 84, 92; Dec. 5, 1949, p. 122, 124, 127-128.

Part I: Mining, both open pit and underground. Taconite rock as a substitute for the gradually declining Mesabi ore. Other domestic sources. Part II: Beneficiation processes in commercial use, and extent to which they are applied to various U. S. iron ores. Part III: Future prospects.

1B-68. Investigation of the Dayton Iron Deposit: Lyon and Storey Counties, Nev. Robert W. Geehan. *U. S. Bureau of Mines*, Report of Investigations 4561, Nov. 1949, 34 pages.

Includes some data on beneficiation.

1B-69. Iron Ore Concentration in Sweden. H. U. Ross. *Skillings' Mining Review*, v. 38, Dec. 10, 1949, p. 1, 4, 13.

Unusual features as compared with U. S. practice.

1B-70. Handling Mesabi's Taconite. *Mining World*, v. 11, Dec. 1949, p. 20-21.

Work of Erie Mining Co. and flow sheet of beneficiation plant. Photomicrographs show structures of various taconites.

1B-71. Future of Iron Resources. Donald B. Gillies. *Mining Engineering* (Features Section), v. 1, Dec. 1949, p. 34-38.

New methods of utilization and conservation of Lake Superior reserves and work being done in Labrador, Newfoundland, Liberia, and in the Adirondacks.

1B-72. Beneficiation of Northern Iron Ores. Francis X. Tartaron. *Iron and Steel Engineer*, v. 26, Dec. 1949, p. 113-118.

See abstract from *Mining Engineering*, item 1B-36, 1949.

1C—Nonferrous

1C-86. Milling and Metallurgy at Central Patricia Gold Mines. D. L. McCann. *Canadian Mining Journal*, v. 70, Nov. 1949, p. 84-90.

Extraction procedures. Mineralogical characteristics of the ore.

1C-87. Milling at Pickle Crow. W. M. McLellan. *Canadian Mining Journal*, v. 70, Nov. 1949, p. 113-116.

Extraction of gold in south central Canada. Includes mill flowsheet.

1C-88. Concentration of Oxide Manganese Ores From the Tintic District, Eureka, Juab County, Utah. A. O. Ipsen, H. D. Snedden, and H. L. Gibbs. *U. S. Bureau of Mines*, Report of Investigations 4545, Nov. 1949, 18 pages.

Marketing specifications. Nature and method of concentration of above ores.

1C-89. Concentration of Manganese Ores From Piute and Kane Counties, Southern Utah. Richard Havens and W. W. Agey. *U. S. Bureau of Mines*, Report of Investigations 4551, Nov. 1949, 9 pages.

Various methods of concentration, including jigging, tabling sized fractions, selective flotation, washing, and sizing.

1C-90. Flotation of Silver Chloride From an Oxide Ore. A. L. Engel and T. A. Jackson. *U. S. Bureau of Mines*, Report of Investigations 4574, Nov. 1949, 5 pages.

Results of cyanidation and flotation tests. A flotation procedure is recommended for its simplicity and satisfactory results.

1C-91. Can Leaching Aid the Copper Mines. Harmon E. Keyes. *Journal of Metals* (Technical Section), v. 1, Nov. 1949, p. 29-31.

The only living member of the original Tainton technical staff that operated the Martinez electrolytic-zinc plant and proved that commercial soundness of high acid–high current density deposition of zinc tells of tribulations encountered in that early work. It is then suggested that copper leaching may well have a great deal in common with zinc hydrometallurgy and that several proven metallurgical processes could be integrated into complete operations adaptable to a wide variety of copper-mine conditions.

1C-92. Titanium Investigation: The Laboratory Development of Mineral-Dressing Methods for Arkansas Rutile. M. M. Fine, H. Kenworthy, R. B. Fisher, and R. G. Knickerbocker. *Mining Engineering* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 184), p. 447-452.

Concentrates of rutile TiO_2 were produced by treating submarginal ore from the Magnet Cove district. Rutile recovery at present is 45-50% of the total TiO_2, with the possibility of increased recovery with additional research.

1D—Light Metals

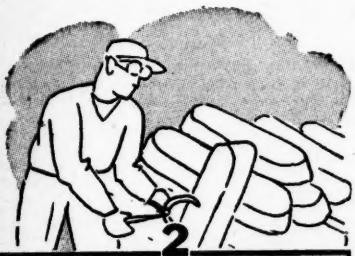
1D-10. Recovery of Alumina From Submarginal Bauxites. Part 1. Electric Furnace Production of Calcium Aluminate and Ferro-Alloy. Charles E. McCarthy, Richard S. Cole, Earl F. Nichols, Hewitt Wilson, and John A. Ruppert. **Part 2. Extraction of Alumina From Electric-Furnace Slags of Calcium Aluminate.** Maurice R. Thompson, Henry M. McLeod, Jr., and Milford L. Skow. *U. S. Bureau of Mines*,

Report of Investigations 4527 and 4528, Nov. 1949, 93 and 91 pages.

107 references.

1D-11. Differential Thermal Analysis Applied to the Lime-Soda Sinter Process. A. J. Kauffman, Jr. *U. S. Bureau of Mines,* Report of Investigations 4585, Nov. 1949, 16 pages.

Method of analysis and survey of investigations of reactions in the dry state. Data are applied to the recovery of alumina from siliceous bauxite, kaolin, and other high-alumina materials. 47 ref.



2 SMELTING, REDUCTION and REFINING

2B—Ferrous

2B-315. Vanadium as a Deoxidizer. S. L. Case. *Iron Age,* v. 164, Nov. 17, 1949, p. 97-102.

Free translation of an article by A. M. Samarin and A. Yu. Polyakov [*Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Jan. 1949, p. 100-113.] Includes translator's critical comments. The derivation of equilibrium constants of vanadium in liquid iron, and relative deoxidation characteristics of vanadium and silicon.

2B-316. Openhearth Metallurgists Consider Oxygen and Manganese Conservation. S. W. Poole. *Metal Progress,* v. 56, Nov. 1949, p. 701, 722, 724, 726, 728, 730, 732, 734.

Report of Sept. 30 meeting of AIME's Openhearth Committee. Use of oxygen; British use of basic refractories; sulfur control in hot metal; conservation of manganese; ingot solidification; mold coatings and surface quality; and soaking-pit practice.

2B-317. Oxygen Injection Applied in Steel Foundry Melting. G. E. Bellew. *American Foundryman,* v. 16, Nov. 1949, p. 24-27.

Injection procedure, acid-electric-furnace melting, acid and basic openhearth melting, basic electric practice, basic openhearth furnaces, and melting of alloy steels.

2B-318. A Study of an Open Hearth Combustion System. Mac Sample. *Blast Furnace and Steel Plant,* v. 37, Nov. 1949, p. 1327-1334.

To ascertain the extent of potential improvements of the openhearth system, an intensive study is being made of one furnace of conventional design including Isley stack control. Results obtained have supplied an explanation for some variations in openhearth operation and have eliminated some weaknesses. Experimental equipment and procedure.

2B-319. A Radio-Active Technique for Determining Gas Transit Times in a Driving Blast Furnace. E. W. Voice. *Journal of the Iron and Steel Institute,* v. 163, Nov. 1949, p. 312-315.

New technique. Results obtained in the first experiment on a 20-ft. furnace. Radon is introduced at the tuyeres by firing of a detonator. A special gas-sampling apparatus is used.

2B-320. Slag Control in the Basic Open Hearth Furnace. I. G. Reginald Bashforth. *British Steelmaker,* v. 15, Oct. 1949, p. 489-494; Nov. 1949, p. 539-542.

Oct. issue: Constitution of basic openhearth slags, removal of phosphorus and sulfur, slag-metal reactions, maximum rate of production, reduction of metallic losses in the slag, durability of furnace hearth, control of refining, and reduction of nonmetallic inclusions. Nov. issue: Methods of slag formation, practical slag control, and application of the principles set forth.

2B-321. Gaseous Oxygen in Iron and Steel Production. D. J. O. Brandt. *Metal Treatment and Drop Forging,* v. 16, Autumn 1949, p. 149-152.

Present situation and possible future trends.

2B-322. Increasing Open Hearth Production by Use of Oxygen, Better Refractories and Control of Slag. Erle G. Hill. *Yearbook of the American Iron and Steel Institute,* 1949, p. 139-154, discussion, p. 154-163.

Previously abstracted from preprint. See item 2B-151, 1949.

2B-323. Finished Steel Production; Possible Increase From Existing Equipment. R. F. Passano. *Yearbook of the American Iron and Steel Institute,* 1949, p. 192-214; discussion, p. 214-220.

Previously abstracted from preprint. See item 2B-149, 1949.

2B-324. Studies Relating to the Control of Sulphur in the Production of Pig Iron. Truman H. Kennedy and Arthur W. Thornton. *Yearbook of the American Iron and Steel Institute,* 1949, p. 222-242; discussion, p. 242-249.

Previously abstracted from preprint. See item 2B-150, 1949.

2B-325. Sulphur Control and Manganese Conservation in Open Hearth Furnaces. D. E. Babcock. *Yearbook of the American Iron and Steel Institute,* 1949, p. 250-312; discussion, p. 312-321.

Previously abstracted from preprint. See item 2B-205, 1949.

2B-326. The Distribution of Oxygen Between Molten Iron and Iron Oxide-Silica Slags. Gerhard Derge. *Yearbook of the American Iron and Steel Institute,* 1949, p. 368-387; discussion, p. 388-396.

Previously abstracted from *Industrial Heating.* See item 2B-232, 1949.

2B-327. The Chemistry of Metallurgical Slags. N. J. Grant and John Chipman. *Yearbook of the American Iron and Steel Institute,* 1949, p. 469-486; discussion, p. 486-491.

Previously abstracted from preprint. See item 2B-152, 1949.

2B-328. Some Notes on the Economics of Tonnage Steel Melting in the Electric Furnace. H. W. McQuaid. *Iron Age,* v. 164, Dec. 8, 1949, p. 86-92.

Improvements in electric-arc furnace design and operation, together with various adverse raw-material market conditions affecting openhearth practice, make the electric furnace a strong competitor in the production of carbon and tonnage alloy grades of steel. Comparative cost data concerning these two methods and converter practice, and factors influencing economic conditions.

2B-329. Iron Blast-Furnace Slag: Production, Processing, Properties, and Uses. G. W. Josephson, F. Sillers, Jr., and D. G. Runner. *U. S. Bureau of Mines,* Bulletin No. 479, 1949, 304 pages.

A comprehensive summary. 554 ref.

2B-330. Gas and Fluid Flow; Experiments in a Side-Blown Converter Model. M. P. Newby. *Iron and Steel,* v. 22, Nov. 22, 1949, p. 545-548; discussion, p. 598-601.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 2B-235, 1949.

2B-331. Experimental Blast-Furnace; Investigations on Temperature and CO_2 Distribution. H. L. Saunders, G. B. Butler, and J. M. Tweedy. *Iron and Steel,* v. 22, Nov. 22, 1949, p. 566-574; discussion, p. 609-612.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 2B-184, 1949.

2B-332. Materials Distribution. Part II. Compensated Charging in the Blast-Furnace. H. L. Saunders, and R. Wild. *Iron and Steel,* v. 22, Nov. 22, 1949, p. 574-578; discussion, p. 609-612.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 2B-260, 1949.

2B-333. Steelmaking Slags; Effect of Sodium Oxide Additions. Part I. Use of Soda to Dephosphorize Pig Iron at 1,400° C. W. R. Maddocks and E. T. Turkdogan. *Iron and Steel,* v. 22, Nov. 22, 1949, p. 578-582; discussion, p. 612.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 2B-283, 1949.

2B-334. Gas Transit Time; Radioactive Technique in Blast Furnace Studies. E. W. Voice. *Iron and Steel,* v. 22, Nov. 22, 1949, p. 596-597; discussion, p. 609-612.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 2B-319, 1949.

2B-335. Tension superficielle et viscosité des scories synthétiques. Première partie. Mélanges binaires. Deuxième partie. Mélanges ternaires, mousses et émulsions de scories. (Surface Tension and Viscosity of Synthetic Slags. Part One. Binary Mixtures. Part Two. Ternary Mixtures, Foams, and Emulsions of Slags.) (Concluded.) Paul Kozakevitch. *Revue de Métallurgie,* v. 46, Aug. 1949, p. 505-516; v. 46, Sept. 1949, p. 572-582.

Surface tension and viscosity were measured for a large number of slag systems, including 105 compositions from the FeO-CaO-SiO_2 system and 93 from the FeO-MnO-SiO_2 system at temperatures up to 1450° C. 73 ref.

2B-336. Consideraçoes Sobre a Fabricaçao de Ferro Esponija. (Factors in the Production of Sponge Iron.) Fernando A. de Toledo Piza. *Boletim da Associaçao Brasileira de Metais,* v. 5, July 1949, p. 253-264.

Two methods for sponge-iron production. Concludes that sponge iron may be quite economically produced in Brazil.

2B-337. Estudo Sôbre a Redutibilidade Comparada de Alguns Minérios de Ferro Brasileiros. (Study of the Comparative Reducibility of Various Brazilian Iron Ores.) Geraldo Melcher and Carlos E. V. Cajado. *Boletim da Associaçao Brasileira de Metais,* v. 5, July 1949, p. 341-361.

A laboratory study of the production of sponge iron by hydrogen reduction.

2B-338. Silicon Losses During Smelting of Ferrosilicon. (In Russian.) P. V. Gel'd, O. A. Esin, N. N. Buinov, and R. M. Lerinman. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, Aug. 21, 1949, p. 1073-1076.

Losses amounting to about 15% of the Si were encountered. Investigation of products evolved and deposited indicated that part of the silicon is evaporated and condensed in the form of SiO, which forms a peculiar slag, resulting in formation of vitreous deposits on the furnace walls.

2B-339. The Bessemer Converter Process. A. B. Wilder. *Journal of Metals* (Technical Section), v. 1, Nov. 1949, p. 22-27; Dec. 1949, p. 20-28.

First section of a two-part article discusses investment costs, history, phosphorus and sulfur limitations, scrap-market conditions, blowing time, quality, and oxidation. Second section describes some recent developments such as oxygen-enriched blast, end-point evaluation, and temperature control.

2B-340. Experiments in Nodular Iron. E. K. Smith. *American Foundryman*, v. 16, Dec. 1949, p. 45-47.

Object of the experiments was to make nodular iron using commercial metal in regular production, both from the electric furnace and the cupola. Preliminary experiments demonstrated the suitability of a low-S, low-P cast iron, melted in an acid-lined arc furnace. In most of the experiments an alloy of 50% Mg and 50% Cu was used as nodulizing agent. Mechanical properties and microstructures.

2B-341. Bessemer Process. *Metal Progress*, v. 56, Dec. 1949, p. 878, 880, 882, 884, 886.

Reviews "Report on the Bessemer Process", *British Iron and Steel Institute*, Special Report No. 42, May 1949. See item 2B-255, 1949.

2B-342. Effect of Slag Types on Heat Treatment of Malleable Iron. G. Vennerholm and H. N. Bogart. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 222-224; discussion, p. 224-225.

Previously abstracted from *American Foundryman*. See item 2B-133, 1949.

2B-343. Some Effects of Deoxidation Treatments on Graphitization of White Cast Iron. Richard W. Heine. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 315-327; discussion, p. 327-331.

Previously abstracted from preprint. See item 2B-130, 1949.

2B-344. Symposium on Nodular Graphite Cast Iron. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 576-585; discussion, p. 585-587.

D. J. Reese discusses properties of ductile iron, thermal tests on spheroidal carbon iron, and malleable foundry production. C. K. Donoho considers the production of the above with Mg. Gosta Vennerholm discusses various methods of production and control of properties. R. G. McElwee sums up the discussion.

2B-345. Gases in Steel. E. W. Pierce. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 45-46; discussion, p. 65-73.

Correlation between atmospheric humidity and hydrogen content.

2B-346. Some Observations on Gases in Steel. C. E. Sims. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 46-52; discussion, p. 65-73.

Behavior of hydrogen in steel, its removal by aging, and effects of other gases.

2B-347. Kinetics of Gases in Steel. L. S. Darken. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 55-59; discussion, p. 65-73.

A model describing the rate of carbon drop in electric and open-hearth furnaces based on the interface film. Hydrogen and nitrogen in the steel bath, hydrogen removal, and the relation between rate of elimination and gas content.

2B-348. The Electric Ingot Process. R. K. Hopkins. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 91-103; discussions, p. 103-105.

For special steels. Machine for casting ingots of definite length. Structure and mechanical properties of the product.

2B-349. The Kellogg Electric Hot-Top Process. R. K. Hopkins. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 106-118; discussion, p. 118-121.

2B-350. Use of Oxygen in the Manufacture of Basic Electric-Furnace Steels. John E. Harrod. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 123-127; discussion, p. 132-140.

Method of introduction; use for stainless, Mn, quality alloy, and rimming steel.

2B-351. Use of Oxygen in the Manufacture of Electric-Furnace Steels. A. C. Ogan. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 127-129; discussion, p. 132-140.

Practice variations at the Duquesne Works of Carnegie-Illinois Corp. from those at South Works.

2B-352. Use of Oxygen in Manufacture of Basic Electric-Furnace Steels. George P. Michalos. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 130-132; discussion, p. 132-140.

Outlines practice at Timken Roller Bearing Co.

2B-353. Relation Between Chromium and Carbon in the Refining of Chromium Steel. D. C. Hilty. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 140-148; discussion, p. 148-153.

The equilibrium constant and the influence of temperature on that constant were derived for the iron-chromium-carbon-oxygen reaction.

2B-354. Use of High-Purity Oxygen for Decarburization in Five-Ton Acid Electric Furnaces. Clyde Wyman, Edmund J. Goehring, and Charles A. Faist. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 154-167; discussion, p. 174-188.

Use of oxygen can be economical and practical if properly handled.

2B-355. Use of Oxygen in Acid Electric Practice. R. H. Jacoby and Marshall Petty. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 168-170; discussion, p. 174-188.

Trial operations at the Key Co., East St. Louis, Ill.

2B-356. Use of Oxygen in the Melting of Stainless Steels for Castings. R. J. Wilcox. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 170-174; discussion, p. 174-188.

Plant equipment, melting equipment, and melting practice. Compares cost and quality with conventional practices.

2B-357. Complex Deoxidizers in Electric-Furnace Cast Steel. H. A. Young. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 189-194; discussion, p. 212-225.

Compares effects of deoxidation additions on notched-bar impact properties and on relative type and arrangement of inclusions.

2B-358. Use of Complex Deoxidizers. G. A. Lilliequist. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 194-198; discussion, p. 212-225.

Use of Al and Ca-Mn silicon for the control of porosity and inclusions.

2B-359. Effects of Complex Deoxidizers on Silicon-Killed Steels, With and Without the Addition of Aluminum. Paul E. Eubanks. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 199-207; discussion, p. 212-225.

2B-360. Use of Complex Deoxidizers. John N. Ludwig, Jr. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 208-212; discussion, p. 212-225.

Use of calcium metal and alloys. Metal conditions prior to use.

2B-361. Elementary Principles in Making a Normal-Alloy Electric-Furnace Heat. W. M. Farnsworth. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 226-230.

Slag-making materials, care of furnace, charging scrap, Cr-Ni-Mo heats, tests of the metal bath, tapping, and pouring.

2B-362. Method for Calculating Electric-Furnace Melting. George E. Wagner. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 230-232.

Method which may be applied as a basis for all melting calculations. Its value increases with increase in percentage of alloys.

2B-363. Graphical Method for Evaluating Openhearth Slags. (In Russian.) L. M. Tsylev. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Aug. 1949, p. 1245-1247.

Chart shows monetary values of slags to be used in the blast furnace as substitutes for iron ore can be read as a function of percentages of Fe, Mn, and lime.

2B-364. Kaltverfestigung und Erholung kohlenstoffarmer Bandstähle unter Berücksichtigung metallurgisch bedingter Werkstoffeigenarten. (Work-Hardening and Recovery of Low-Carbon Strip Steels as Related to Metallurgical Characteristics of the Material.) Georg Niebch and Jacques Brockhaus. *Archiv für das Eisenhüttenwesen*, v. 20, Sept.-Oct. 1949, p. 329-336.

Object of investigation was to determine effect of melting method on mechanical properties of cold rolled and annealed strip steels and to find a method for equalizing the strength properties of steels produced by different methods. Includes a review of the literature and a discussion of test methods.

2B-365. Siemens-Martin-Stahlwerk mit Eigengruppenschaltung der Gaserzeuger je Ofen und anderen Zweckmässigen Betriebseinrichtungen. (Steel Mills With Gas Generators Connected to Each Furnace in Individual Groups and With Other Suitable Equipment.) Gustav Neumann and Otto Weber. *Stahl und Eisen*, v. 69, Oct. 13, 1949, p. 731-734.

The gas generators are installed so that each furnace can be operated independently; this permits close control of air, gas, and coal consumption; also several other advantages.

2B-366. Die Manganwirtschaft im Thomasstahlwerk. (Economizing on Manganese in the Basic Bessemer Plant.) Josef Klärding. *Stahl und Eisen*, v. 69, Sept. 29, 1949, p. 691-695.

Several different ways of economizing on Mn. Shows that the deoxidizing effect of Mn can partly be replaced by other deoxidizing agents. Graphs indicate the most economic use of Mn for different types of steel.

2B-367. Physikalische und mechanische Betrachtungen über die Verbrennung im Siemens-Martin-Ofen. (Physical and Mechanical Observations on Combustion in the Openhearth Furnace.) Alfred Mund. *Stahl und Eisen*, v. 69, Sept. 29, 1949, p. 706-711.

Views by German and foreign authorities are critically evaluated. An entirely new type of heating system is proposed. Its operation and effects, and advantages over more orthodox systems.

2B-368. Temperatur- und Flammenmessung beim Windfrischverfahren. (Temperature and Flame Measurement in the Converter Process.) Gerhard Gille and Jacob Willems. *Stahl und Eisen*, v. 69, Oct. 27, 1949, p. 759-762.

Simultaneous measurement of bath temperature and flame radiation discloses a relationship between melt temperature at the radiation maxi-

mum and final temperature. Equipment used.

2B-369. Beobachtungen zum Reaktionsablauf gegen Ende des Windfrischens mit Hilfe von Temperatur- und Flammenmessung. (Observations on Reactions Towards the End of the Converting Operation by Means of Temperature and Flame Measurements.) Jacob Willems, Gerhard Gille, and Heinz Höfges. *Stahl und Eisen*, v. 69, Oct. 27, 1949, p. 762-764.

Temperature of the melt has a determining effect on the slagging of iron and phosphorus. The radiation maximum occurs towards the end of the operation at various melting temperatures and phosphorus contents. These facts should be considered in determining the end of the melting period. 12 ref.

2B-370. Zink im Hochofen. (Zinc in the Blast Furnace.) Engelbert Sedloczek. *Stahl und Eisen*, v. 69, Oct. 27, 1949, p. 772-773.

Investigation of smelting an ore containing 1.47% Zn. Effects on the furnace lining.

2C—Nonferrous

2C-94. Modern Techniques in the Refining of Non-Ferrous Metals. *Metal Treatment and Drop Forging*, v. 16, Autumn 1949, p. 157-163.

Reviews papers on refining of Cu, Al, Zn, and Mg presented at symposium on "Refining of Non-Ferrous Metals", Institution of Mining and Metallurgy, London, Summer 1949.

2C-95. Elettrometallurgia dello stagno. (Electrometallurgy of Tin.) Corrado Ferrante. *La Metallurgia Italiana*, v. 41, July-Aug. 1949, p. 190-198.

Chemistry and classical methods. Installation in which 15 tons per day of 99.96% Sn are produced from cassiterite.

2C-96. Waelz Plants for Low-Grade Tin. C. W. Jensen. *Mining Magazine*, v. 81, Nov. 1949, p. 265-268.

German smelting practice using low-grade concentrates.

2C-97. Vacuum Distillation Tests Indicate a Better Way To Treat Parkes Process Crusts. A. W. Schlechten and C. H. Shih. *Engineering and Mining Journal*, v. 150, Dec. 1949, p. 80-81.

Silver, 95% pure, was recovered from Parkes Process crusts by vacuum distillation in laboratory experiments. Recovery was made in only one step as compared with distillation plus cupellation plus recupellation involved in present commercial practice.

2C-98. Lead Smelting in the Ore Hearth. I. Problems Involved in Smelting Rich Charges. G. L. Oldright. *U. S. Bureau of Mines*, Report of Investigations 4562, Nov. 1949, 18 pages.

Properties of lead compounds and limitations in roasting richer lead products. 11 ref.

2C-99. Recovery of Fumes From Chloride Volatilization of Gold. A. L. Engel and H. J. Heinen. *U. S. Bureau of Mines*, Report of Investigations 4582, Nov. 1949, 13 pages.

Reviews previous investigations. Test apparatus, furnace charge, volatilization test procedure, draft control, fume diffusion, addition reagents, and dust collection.

2C-100. Modern Billet Casting, With Special Reference to the Solidification Process. E. Scheuer. *Journal of the Institute of Metals*, v. 76, Oct. 1949, p. 103-120.

Requirements of an ideal billet-casting process outlined on the basis of the structure of an ideal billet. Conventional billet-casting methods fail to meet these requirements in many respects, and developments aiming at overcoming these deficiencies are reviewed. The latest is the continuous-casting process. 21 ref.

2C-101. Petrology of High Titanium Slags. Charles H. Moore, Jr., and H. Sigurdson. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 185), p. 914-919.

Preparation and petrographic technique for slags of the CaO-MgO-TiO_2-Al_2O_3-SiO_2 system produced from ilmenite ores reduced by carbon in an electric furnace.

2C-102. Laboratory Smelting of Titaniferous Ores. D. L. Armant and S. S. Cole. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 185), p. 909-913.

Adaptation of melting-point data to slag formation is shown. Ilmenites containing 38-44% TiO_2 were smelted to produce fluid slags with 65-69% TiO_2. A high-Ti slag was produced in which the formation of appreciable amounts of trivalent Ti was avoided. They can be produced in an arc furnace with slag temperatures of 1450-1550° C. 11 ref.

2C-103. Melting Points in the System TiO_2-CaO-MgO-Al_2O_3. H. Sigurdson and S. S. Cole. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 185), p. 905-980.

A micro-pyrometer and a platinum-strip furnace were used to determine the above. Since the purpose was primarily to provide useful data for smelting titaniferous ores, work was restricted to the zone of the system which would include the crystalline phases present in the slags. Results are shown on ternary diagrams and by spectrometer data.

2C-104. The Relationship Between Electrical Conductivity and Composition of Molten Lead Silicate Slags. A. Kenneth Schellinger and Robert P. Olsen. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 185), p. 984-986.

Straight-line plots are developed from the above relationships by use of logarithms and reciprocals. Use in determination of composition.

2C-105. Vacuum Distillation of Metals. *Metal Progress*, v. 56, Dec. 1949, p. 870, 876.

Summarizes "Low Pressure Distillation of Zinc From Al-Zn Alloy", by Max J. Spendlove and Hillary St. Clair, *Journal of Metals* (Transactions Section). See item 2C-75, 1949.

2C-106. Kinetics of Reduction of Copper Oxides by Carbon Monoxide and by Hydrogen. (In Russian.) E. P. Tatievskaya, M. G. Zhuraveleva, and G. I. Chufarov. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Aug. 1949, p. 1235-1241.

Experimentally investigated, comparing rates of reduction of CuO and Cu_2O. 10 ref.

2D—Light Metals

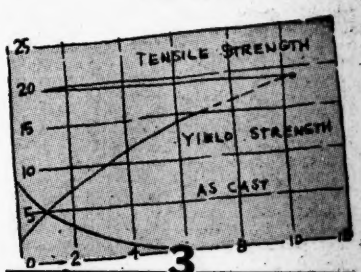
2D-33. Fluxing of Aluminum Alloys. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 307-309; discussion, p. 309.

Previously abstracted from preprint. See item 2D-14, 1949.

2D-34. Grain Refining of Aluminum Alloys and Its Effects on Physical Properties. Walter Bonsack and O. Tichy. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 509-518; discussion, p. 518-520.

Previously abstracted from preprint. See item 2D-13, 1949.

For additional annotations indexed in other sections, see: 3D-85; 16C-16; 17-110; 19B-222; 22B-414



3

PROPERTIES

3A—General

3A-240. The Change of Entropy, Volume and Binding State of the Elements on Melting. O. Kubaschewski. *Transactions of the Faraday Society*, v. 45, Oct. 1949, p. 931-940.

Physical properties of the elements, such as electrical conductivity and magnetic susceptibility, depend on the binding mechanism. Molar heat capacity at the melting point divided by absolute temperature of fusion and cubic coefficient is also a measure of the bonding mechanism. Concludes that the semi-metals partially lose their homopolar bonds on melting. A relation is found between lowering of melting point by pressure and atomic volume. 87 ref.

3A-241. New Data on Strength of Metals. *Aviation Week*, v. 51, Nov. 21, 1949, p. 30-32.

New data in the aircraft manufacturing industry's "Bible"—ANC-5a—"Strength of Metal Aircraft Elements". This new issue brings up to date data to be used in the design of all U. S. aircraft, whether Air Force, Navy, commercial or personal types.

3A-242. New Interpretation of the n-Power Law in Plastic Deformation. Herbert I. Fusfeld. *Journal of Applied Physics*, v. 20, Nov. 1949, p. 1052-1055.

Shows that the n-power law describing a true stress-strain curve, normally written as $S = k\delta^n$, can be placed in the form $S = S_o\ (e\delta/n)^n$ where S_o is engineering tensile strength. Application to tensile curves. A plot of S/S_o as a function of n, for a fixed value of logarithmic strain, provides a general description of the behavior of all materials in plastic deformation.

3A-243. Theory of the Formation of Powder Patterns on Ferromagnetic Crystals. Charles Kittel. *Physical Review*, ser. 2, v. 76, Nov. 15, 1949, p. 1527.

3A-244. On the Conditions for the Occurrence of Ferromagnetism in Metal Compounds. (In English.) J. H. Gisolf. *Physica*, v. 15, Sept. 1949, p. 677-678.

On the basis of theory and known facts, certain structural conditions necessary for ferromagnetism are stated.

3A-245. Relation Between the Thermal Expansion, the Curie Temperature and the Lattice Spacing of Homogeneous Ternary Nickel-Iron Alloys. (In English.) J. J. Went. *Physica*, v. 15, Sept. 1949, p. 703-710.

Determined for 15 only slightly different homogeneous ternary Ni-Fe alloys containing about 50% Fe and 50% Ni. Value of the change in Curie temperature depends upon the position of the third alloying element in the periodic system of elements. There is no direct relation between change in Curie temperature and lattice spacing.

3A-246. The Plastic Behaviour of Solids. Andrew McCance. *Journal of the Iron and Steel Institute*, v. 163, Nov. 1949, p. 241-249.

Fourth Hadfield Memorial Lecture discusses the theory of plastic extension, indicating disagreement with the von Mises-Hencky view that the plastic stage is merely a degenerated elastic stage whose behavior can be formulated by an extension of elasticity theory. Equations derived from the author's theory were tested by work on steel, Cu, Al, Pb, and nonmetallics. Includes variations in plastic behavior; brittleness and plasticity; behavior of rubber; and creep under constant load. 19 ref.

3A-247. Local Overstraining of Metals. F. Laszlo. *Engineering*, v. 168, Oct. 28, 1949, p. 437-440; Nov. 4, 1949, p. 468-470.

Oct. 28 issue. Local overstraining occurs in connection with a great variety of production processes and while in service. It may be caused by mechanical overstraining, by stress concentration and by hardening of steel in which phase transformations result in a volume change. Effects of nonuniform heating are believed to be the most harmful. Means for minimizing overstraining resulting from hot and cold working. Second installment: Results of a study of overstraining encountered during development of a 5000-hp. synchronous motor.

3A-248. Properties of Engineering Materials. Gilbert Cook. *Engineering*, v. 168, Oct. 28, 1949, p. 443-444; Nov. 4, 1949, p. 473. A condensation.

See abstract from *Engineer*, item 3A-223, 1949.

3A-249. De l'importance des propriétés ferromagnétiques pour la connaissance des alliages. (Importance of Ferromagnetic Properties of Alloys for Their Evaluation.) Charles Guillaud. *Revue de Métallurgie*, v. 46, July 1949, p. 453-456.

How the ferromagnetic properties of alloys, especially Curie point, curve of magnetization vs. temperature, and point of saturation, may be used as an aid to research on different alloys. Method of interpretation of obtained data.

3A-250. Comportement mécanique des métaux polycristallins isotropes. Analogie des facteurs fragilisants. (Mechanical Behavior of Isotropic Polycrystalline Metals. Analogy of Brittleness Factors.) André Gueussier and René Castro. *Revue de Métallurgie*, v. 46, Aug. 1949, p. 517-536.

Influences of three essential parameters of elastic and plastic deformation (separately or combined) were studied for isotropic metals, especially steels. These parameters are: state of stress, characterized by index of triaxiality, reciprocal of the temperature of deformation, and rate of deformation. They are designated as "brittleness factors". 22 ref.

3A-251. Propriétés électriques des métaux et liaison métallique. (Electrical Properties of Metals and Metallic Bonds.) R. Piontelli. *Journal de Chimie Physique et de Physico-Chimie Biologique*, v. 46, May-June 1949, p. 288-297; discussion, p. 297.

Relationship of the electrochemical properties of metals and the energy of their molecular bonds. Data for different metals.

3A-252. Investigation of the Nernst Thermomagnetic Effect in Crystals of Ferrosilicon and Ni-Mn Alloy. (In Russian.) P. G. Armaev. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, July 1, 1949, p. 41-44.

Presents a theory of odd and even effects in the case of simple anisotropy and investigates the above effect. Dependence of this effect and the Nernst constant on time of annealing at 397° C. followed by rapid air cooling are indicated.

3A-253. Fatigue Characteristics of Electroformed Sheets With and Without Iron Backing. Harry K. Herschman and Carroll Thomas. *Journal of Research of the National Bureau of Standards*, v. 43, Nov. 1949, p. 477-486.

Flexural fatigue properties were determined for electroformed laminar sheets of Fe-Ni and Fe-Ni-Cr, and for plates composed of electroformed Fe-Ni sheets bonded with solder or a plastic adhesive to open-hearth iron. The fatigue limit of the Fe-Ni composite was decreased when a thin deposit of Cr was applied to the Ni face. Heating the Fe-Ni-Cr sheets at 260° C., before machining, improved their fatigue properties. Further beneficial effects were obtained by heating after machining. Fatigue limits of the plates bonded with plastic adhesive were significantly higher than those joined by soldering.

3A-254. Contribution to the Theory of Heat Resistance of Metallic Solid Solutions. (In Russian.) I. I. Kornilov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, Aug. 21, 1949, p. 1037-1040.

Heat stability of solid solutions of 11 different binary, ternary, and quaternary systems of ferrous and nonferrous metals were investigated using a new centrifugal mechanical testing method.

3A-255. Theory of the "Supporting" Properties of Metal. (In Russian.) G. V. Uzhik. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 1, 1949, p. 61-64.

The ability of metals to withstand stress concentration (load applied to a notched specimen). Method of theoretical calculation. Experimental data confirm validity of the theory.

3A-256. Analytical Expression of the Relationship Between Melting Point and Thermal Stability of Metallic Alloys. (In Russian.) K. A. Osipov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 1, 1949, p. 81-82.

A formula, based on Mott's equation, for the determination of rate of slip. Experimental investigation indicates validity of the formula.

3A-257. Influence of a Magnetic Field on the Conductivity of Thin Metallic Films. E. H. Sondheimer. *Nature*, v. 164, Nov. 26, 1949, p. 920-921.

A new type of magneto-resistance effect in metals has recently been discovered by D. K. C. MacDonald in thin wires at low temperatures under certain conditions. A corresponding effect exists—and a detailed mathematical treatment is possible—for the particular case of a thin film placed in a magnetic field which is normal to the surface of the film.

3A-258. The Plastic Behaviour of Solids. Andrew McCance. *Engineering*, v. 168, Nov. 25, 1949, p. 570-574.

Previously abstracted from *Journal of the Iron and Steel Institute*. See item 3A-346, 1949.

3A-259. Influence of a Magnetic Field on the Size-Variation of Electrical Conductivity. K. Sarginson and D. K. C. MacDonald. *Nature*, v. 164, Nov. 26, 1949, p. 921-922.

Theoretical analysis.

3A-260. Plastic Buckling of a Long Flat Plate Under Combined Shear and Longitudinal Compression. Elbridge Z. Stowell. *National Advisory Committee for Aeronautics*, Technical Note 1990, Dec. 1949, 17 pages.

The condition is obtained by a simple extension of the theory of plastic buckling that applies when loads are applied separately. Results are presented as interaction curves.

3A-261. Effects of Temperature Variations on Dimensional Changes of Metals. *Tool Engineer*, v. 23, Dec. 1949, p. 42.

A chart plus numerical examples.

3A-262. A.S.M. Seminar on Thermodynamics in Physical Metallurgy. John C. Fisher. *Metal Progress*, v. 56, Dec. 1949, p. 816-818.

Proceedings of seminar, held at National Metal Congress, Cleveland, 1949.

3A-263. Workhardening of Metals—A General Theory. Alfred M. Freudenthal. *Journal of the Franklin Institute*, v. 248, Dec. 1949, p. 523-536.

Plastic deformation of metals and structural theories of work hardening. A general law of work hardening. Equations and general relationships, and experimental and theoretical curves for mild steel.

3A-264. Effect of Hydrostatic Pressure on Plasticity and Strength. P. W. Bridgman. *Research*, v. 2, Dec. 1949, p. 550-555.

Tensile tests; effects of pressure on ductility and strain hardening; effect of pressure on fracture; application to wiredrawing; effect of pressure on elastic limit and shear of steel; simple apparatus for torsion experiments.

3A-265. Physical and Chemical Adsorption of Long Chain Compounds on Metals. F. P. Bowden and A. C. Moore. *Research*, v. 2, Dec. 1949, p. 585-586.

Experiments made to determine directly whether or not chemical reaction takes place between adsorbed films and metal surfaces. 10 ref.

3A-266. Magnetic-Optical Phenomena in Ferromagnetics. (In Russian.) S. V. Vonsovskii and A. V. Sokolov. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 19, Aug. 1949, p. 703-708.

A quantum-mechanical study. 12 ref.

3A-267. Technological Deformability of Metals Under Pressure. (In Russian.) S. I. Gubkin. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Aug. 1949, p. 1242-1244.

Investigation reveals the practical value of the new concept of "technological deformability". Cases where it proves especially useful. Method of determination.

3A-268. Mechanics of Elastic-Ductile-Plastic Bodies. IV. Tension and Compression of Prisms. (In Russian.) A. I. Gubanov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Aug. 1949, p. 892-910.

Theoretically analyzes the simplest example of deformation other than pure slip—that of unilateral tensile and compressive stressing of a rod of constant cross section. Equations covering three general cases are interpreted for different values of variables.

3A-269. Über die auf eine Versetzung wirkenden Kräfte. (Concerning the Forces Acting on a Displacement.) Günther Leibfried. *Zeitschrift für Physik*, v. 126, Oct. 17, 1949, p. 781-789.

A theoretical contribution to the theory of plastic deformation.

3A-270. Zur Theorie der Schraubenversetzung. (Concerning the Theory of "Screw" Displacement.) Günther Leibried and Horst-Dietrich Dietze. *Zeitschrift für Physik*, v. 126, Oct. 17, 1949, p. 790-808.

The meaning of "screw" displacement; "elastic" equations, displacements in the infinite space according to Peierls, elastic solution for the plate, and displacement at a uniform rate. 14 ref.

3A-271. Conductibilité électrique des dépôts métalliques très minces à la température de l'hélium liquide. (Electrical Conductivity of Very Thin Metallic Films at the Temperature of Liquid Helium.) Pierre Lainé, Boris Vodar, Nicolar Mostovetch, Marc Barbaron, and Rudolf Spöndlin. *Comptes Rendus* (France), v. 229, Oct. 24, 1949, p. 815-818.

At such temperatures resistance depends, to a great extent, on applied potential. This deviation from Ohm's law is explained theoretically.

3A-272. (Book) Numerical Analysis of Heat Flow. G. M. Dusinberre. 227 pages. 1949. McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y.

Finite difference methods for the calculation of heat flow in solids. Much of the theory is said to be original with the author. A variety of techniques for attacking almost any heat-conduction problem in the steady or transient state. 58 ref.

3B—Ferrous

3B-259. What To Do About Temper Brittleness of Steels. Leonard D. Jaffe. *Steel*, v. 125, Nov. 21, 1949, p. 86-89, 114.

Recommendations for preventing appearance of temper brittleness, which is said to be much more prevalent than usually believed, on the basis of a critical review of recent research. 18 ref.

3B-260. Fatigue Limit of Chromium Plated Steel. *Iron Age*, v. 164, Nov. 24, 1949, p. 82. Based on *National Bureau of Standards*, Technical Report 1379.

In all cases tested involving specimens of SAE X4130 and 6130 rod, Cr plating was found to reduce fatigue limits, although the effect was less pronounced under some conditions than others. Three possible causes are discussed.

3B-261. Effect of Boron and Kind of Boron Addition Upon the Properties of Steel. R. A. Grange, W. B. Seems, W. S. Holt, and T. M. Garvey. *Blast Furnace and Steel Plant*, v. 37, Nov. 1949, p. 1337-1338.

Previously abstracted from *American Society for Metals*, Preprint No. 5, 1949. See item 3B-196, 1949.

3B-262. Mechanical Properties of Low-Carbon, Low-Alloy Steels Containing Boron. W. E. Bardgett and L. Reeve. *Journal of the Iron and Steel Institute*, v. 163, Nov. 1949, p. 277-294.

Test results in the normalized condition. The outstanding feature was the marked effect of Mo in the presence of B in enhancing maximum stress and yield stress. In a low-carbon Mo-B steel, the presence of the B almost doubled the yield stress with good ductility and toughness retained.

3B-263. Über unvollständig ausgesteuerte Magnetisierungsschleifen von Dauermagnetwerkstoffen. (Magnetization Curves of Unsaturated Permanent Magnet Materials.) Werner Jellinghaus. *Zeitschrift für Metallkunde*, v. 40, Sept. 1949, p. 339-344.

Internal magnetization curves of nine different materials of very different magnetic properties were determined.

3B-264. Relazione fra il grado di saturazione e la velocità di raffreddamento nelle ghise ipoeutettiche. (Relationship Between Degree of Saturation and Cooling Rate of Hypo-Eutectic Cast Irons.) Cesare Bordoni. *La Metallurgia Italiana*, v. 41, July-Aug. 1949, p. 185-189.

Proposes formulas for determination of degree of saturation on the basis of cooling rate and thickness of casting. Relation between degree of saturation and mechanical properties of cast iron.

3B-265. Temperature Dependence of Coercive Force in Monocrystals of Transformer Steel. (In Russian.) Ya. S. Shur and K. B. Vlasov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, June 21, 1949, p. 1081-1084.

Investigated along different crystallographic directions over a large temperature range (−195 to 400° C.) using monocrystalline disks differently heat treated (high-temperature annealing in hydrogen, cooling in a magnetic field, under magnetic screening, and aging). 6 ref.

3B-266. Effect of Sulphur on Quality and End Use of Steel Products. M. Tenenbaum. *Yearbook of the American Iron and Steel Institute*, 1949, p. 322-360; discussion, p. 361-365.

Previously abstracted from preprint. See item 3B-101, 1949.

3B-267. Effect of Sulphur on Steel Quality. *Industrial Heating*, v. 16, Nov. 1949, p. 1998, 2000. Condensed from paper by M. Tenenbaum.

See abstract from *American Iron and Steel Institute*, Preprint, item 3B-101, 1949.

3B-268. Some Engineering Aspects of Nodular Cast Iron. C. R. Austin. *Iron Age*, v. 164, Dec. 1, 1949, p. 79-85.

Aspects having particular influence on various applications. Microstructures and physical properties, and results of dynamometer tests of nodular-iron brake drums. Illustrated.

3B-269. Influence of Various Alloying Elements on the Tensile Strength and Yield Point of Steel Containing 0.1 Percent Carbon. *Production Engineering & Management*, v. 24, Dec. 1949, p. 69.

A graph.

3B-270. Engineering Steels Under Combined Cyclic and Static Stresses. H. J. Gough. *Engineer*, v. 188, Oct. 28, 1949, p. 497-500; Nov. 4, 1949, p. 510-514; Nov. 11, 1949, p. 540-543; Nov. 18, 1949, p. 570-573.

A long-range investigation of the fundamentals of practical design of engineering components subjected to combined flexural and torsional stresses, of which the engine crankshaft is the typical example, was begun in the early thirties. Reversed and static bending and torsional stresses, singly and in various combinations, are the major variables. Fourteen steels and cast irons were investigated using a special combined stress-fatigue testing machine. 32 ref.

3B-271. Strain Aging; Change in Electrical Resistance. A. H. Cottrell. *Iron and Steel*, v. 22, Nov. 22, 1949, p. 564-565; discussion, p. 607-608.

Previously abstracted from *Journal of the Iron and Steel Institute*. See item 3B-229, 1949.

3B-272. Boron; Effect on Mechanical Properties of Low-Carbon Low-Alloy Steels. W. E. Bardgett and L. Reeve. *Iron and Steel*, v. 22, Nov. 22, 1949, p. 582-587; discussion, p. 601-602.

Previously abstracted from *Journal of the Iron and Steel Institute*. See item 3B-262, 1949.

3B-273. Champ coercitif et dimension cristalline. (Coercive Force and Crystal Dimensions.) Félix Bertaut. *Comptes Rendus* (France), v. 229, Aug. 8, 1949, p. 417-419.

Magnetic properties of iron powder are dependent largely on structure. The relationship between Bragg dimensions and coercive force.

3B-274. Existence dans le fer et l'acier d'une évolution réversible, à basse température, de la fragilité, due à l'hydrogène. (Existence in Iron and Steel of a Reversible Brittleness Transformation at Low Temperatures Due to the Presence of Hydrogen.) Paul Bastien and Pierre Azou. *Comptes Rendus* (France), v. 229, Sept. 12, 1949, p. 549-551.

Attempts to explain the anomalous behavior of brittleness in iron and low-carbon steel charged with hydrogen. There is a considerable decrease in brittleness below −110° C., which reappears on rise of temperature above this point. The explanation is based on the reduced internal pressure of the hydrogen at the lower temperatures, resulting in decrease of triaxial stresses.

3B-275. Laws of the Variations of Tensile Strength During Annealing of Steel. (In Russian.) S. Z. Bokshtein. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, Aug. 1, 1949, p. 651-654.

Variations of tensile strength of medium-carbon steel (0.40% C, 0.36% Mn, and 2.70% Si) were investigated over a wide range of annealing temperatures. Data indicate that tensile strength increases with temperature of annealing, reaching its maximum at 300-400° C., and then decreases with increasing temperature. Long-time annealing at 650° C. (25 hr.) results in a lower tensile strength than annealing for 1 hr. only. It is believed that this decrease in tensile strength with long-time annealing is caused by disintegration of the carbide phase with formation of graphite. 10 ref.

3B-276. Contribution to the Theory of Coercive Force of Soft Steel. (In Russian.) E. Kondorskii. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 1, 1949, p. 37-40.

Theoretical analysis applicable to two general cases.

3B-277. Static Failure and Fatigue of Steels With Particular Reference to Welded Structures. M. Ros. *Sheet Metal Industries*, v. 26, Nov. 1949, p. 2417-2426, 2440; Dec. 1949, p. 2625-2656, 2658.

Theories proposed by Laboratoire Federal d'Essai des Materiaux, Zurich, Switzerland, to explain the above.

3B-278. The Use of Phosphorus in Plain Carbon Steel Hoop. R. W. Sandelin. *Wire and Wire Products*, v. 24, Dec. 1949, p. 1122-1124.

Effects of phosphorus, especially in barrel hoops. Mechanical properties are tabulated. Value for material requiring severe cold working.

3B-279. Flow and Fracture Characteristics of a Die Steel at High Hardness Levels. L. J. Klingler, C. C. Chow, and G. Sachs. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 185), p. 927-932.

Investigation was conducted on an air hardening nondeforming die steel.

3B-280. Selection of Steel for Automobile Parts; What Engineers Should Know Today About Hardenability-Band Steels. Part V. Another Method of Hardenability Correlation. A. L. Boege-

hold, *SAE Journal*, v. 57, Dec. 1949, p. 29-31.

Another graphical method.

3B-281. Valve Type Related To Operating Needs. *SAE Journal*, v. 57, Dec. 1949, p. 71-73. Based on "Recent Trends in Engine Valve Design and Maintenance for Automotive and Diesel Engines", by Norman Hoertz and R. Max Rogers.

Properties of the various alloy types, with emphasis on their behavior in service (corrosion resistance, thermal resistance, physical and mechanical properties). Effects of design variations.

3B-282. A Practical Evaluation of Ductile Cast Iron. T. E. Eagan and J. D. James. *Iron Age*, v. 164, Dec. 8, 1949, p. 75-79; Dec. 15, 1949, p. 77-82.

In interim report based on a series of tests involving full-size castings. First installment: foundry practice, mass effect, heat treatment, and impact strength. Concluding installment: a series of bursting and endurance tests on full-size pressure vessels; properties of a conveyor part cast in ductile iron and other ferrous metals.

3B-283. An Introduction to Gases in Steel. Dennis J. Carney, John Chipman, and Nicholas Grant. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 34-45; discussion, p. 65-73.

Apparatus for determining gas solubilities in metal. Effect of water vapor on the solubility of H_2 in steel; and effects of H_2 on mechanical properties. 23 ref.

3B-284. Relationship Between Hydrogen Content and Ductility of Steels. Shadburn Marshall, T. M. Garvey, and D. S. Llewelyn. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 59-65; discussion, p. 65-73.

3B-285. Properties of Cast Iron in Relation to the Carbon Equivalent Value. H. T. Angus, F. Dunn, and D. Marles. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 24-44; discussion, p. 44.

Reviews previous attempts to find a relationship between analysis and mechanical properties of cast iron. 22 ref.

3B-286. Effect of Aluminum and Vanadium on Toughness of High Hardenability Cast Steels. J. F. Wallace. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 269-280; discussion, p. 280.

Previously abstracted from preprint. See item 3B-81, 1949.

3B-287. Effect of Boron on Structure and Some Physical Properties of Plain Cast Irons. A. I. Krynitsky and Harry Stern. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 475-487; discussion, p. 487-488.

Previously abstracted from preprint. See item 3B-67, 1949.

3B-288. Coercive Force of Hardened "ShKh15" Steel. (In Russian.) B. K. Vainshtein and B. G. Livshits. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Aug. 1949, p. 871-881.

Influence of residual austenite and martensite on physical properties of the above steel (1.07% C, 1.45% Cr, 0.42% Mn, 0.25% Si, and 0.03% P). It was found that the intensive growth of martensite occurring after solution of carbide does not influence coercive force and electrical resistance. Residual austenite is the main factor causing decrease of magnetic saturation and magnetic permeability. 10 ref.

3B-289. Toughness and Cold Brittleness in the Presence of Initial Static Stresses. (In Russian.) V. P. Degtyarev. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Aug. 1949, p. 882-891.

Studied for steels containing 0.53-2.61% C, 0.27-0.6% Mn, 0.18-2.69% Si, 0.013-0.1% S, 0.031-0.14% P, 0-8.5% Cr, and 0-0.8% Ni. Initial static compressive stresses increase toughness and decrease critical temperature of brittleness. Initial tangential static stresses also have the same effect on brittleness. Test apparatus and method of investigation.

3B-290. Seile für Spannbeton. (Cables for Prestressed Concrete.) Reinhold Baum. *Stahl und Eisen*, v. 69, Oct. 13, 1949, p. 740-744.

Concrete is prestressed to increase its tensile strength. Various methods of prestressing in 1, 2, or 3 axial directions; various types and sizes of steel cables used and their tensile and bending strengths when embedded in concrete.

3B-291. Dauerversuche an Schraubenfedern. (Long-Time Tests on Coil Springs.) Max Hempel. *Stahl und Eisen*, v. 69, Sept. 29, 1949, p. 712-713.

Test results on alloy and carbon-steel springs. The tests were made at room temperature and at 250° C.

3B-292. Magnetische Untersuchungen an kohlenstoffarmen Eisen-Chrom-Legierungen. (Magnetic Investigation of Low-Carbon Iron-Chromium Alloys.) Hermann Fahlenbrach. *Archiv für das Eisenhüttenwesen*, v. 20, Sept.-Oct. 1949, p. 293-299.

Alloys of iron containing up to 30% Cr, up to 7% Al, and up to 5% Si were studied for their permeability at small field strengths and their coercive force after heat treatments at 900 and 1100° C. Practical uses of the various alloys. 23 ref.

3B-293. Die mechanischen Eigenschaften von titanlegierten Blechen nach Luftabkühlung aus der Walzhitze. (The Mechanical Properties of Titanium-Containing Sheets After Air Quenching From Rolling Heat.) Peter Bardenheuer and Wilhelm Anton Fischer. *Archiv für das Eisenhüttenwesen*, v. 20, Sept.-Oct. 1949, p. 313-322.

Three test steels (0.4-1.2% Ti and 0.10% C) were melted in the electric-arc furnace; and one steel with 0.6% Ti in the openhearth furnace. They were rolled at different temperatures to 20 and 12 mm. thickness. Mechanical properties were determined at room temperature, 350 and 500° C. Macrostructures and outer appearances of test samples.

3B-294. Zug- und Kerbschlagversuche an Chrom-Nickel-Molybdän, Chrom-Molybdän- und Chrom-Vanadin-Stählen in der Wärme und Kälte. (Tensile and Notch-Impact Tests on Chromium-Nickel-Molybdenum, Chromium-Molybdenum and Chromium-Vanadium Steels at High and Low Temperatures.) Anton Pomp and Alfred Krisch. *Archiv für das Eisenhüttenwesen*, v. 20, Sept.-Oct. 1949, p. 323-328.

One hundred forged and annealed specimens were investigated to determine differences between the recently developed alloys and those made in earlier years. 17 ref.

3B-295. Contribution à l'étude de la relation entre la structure micrographique et la résistance au fluage. Influence de la charge. (Contribution to the Study of the Relationship Between Microstructure and Creep Strength. Influence of Applied Load.) Georges Delbart and Michel Ravery. *Comptes Rendus* (France), v. 229, Oct. 17, 1949, p. 759-760.

Investigated for 0.6% Cr, 0.6% Mo steel with particular emphasis on the relationship between rate of creep and load applied at a given temperature.

3C—Nonferrous

3C-246. Creep of Titanium at Room Temperature. Heinrich Adenstedt. *Metal Progress*, v. 56, Nov. 1949, p. 658-660.

Experimental data compared with those of other investigators.

3C-247. Magnetic Properties of Nickel-Cobalt and Related Alloys. E. P. Wohlfarth. *Philosophical Magazine*, ser. 7, v. 40, Nov. 1949, p. 1095-1111.

Discussed on the basis of the collective electron theoretical treatment of ferro-magnetism. Assumptions are briefly discussed in relation to the present work. Experimental results for Ni-Co and Ni-Fe alloys include variation of saturation moment and Curie temperature with concentration, and of susceptibility and spontaneous magnetization with temperature. 24 ref.

3C-248. Festigkeitseigneschaften verschiedener Drukguss-Werkstoffe. (Strength Properties of Different Pressure-Cast Materials.) Erich Meyer-Rässler. *Zeitschrift für Metallkunde*, v. 40, Sept. 1948, p. 355-358.

Production and testing of standard test bars of Al, Mg, and Zn alloys and brass.

3C-249. Leghe rame-berillio-manganese ricche in rame. (Copper-Rich Copper-Beryllium-Manganese Alloys.) Venturello and Mocarksi. *La Metallurgia Italiana*, v. 41, July-Aug. 1949, p. 181-184.

Many with increasing contents of Be and Mn up to about 2.5% and 8% respectively were examined. Shows that Mn accelerates separation of CuBe, thus diminishing the time necessary for aging treatment and improving the mechanical properties of the alloys. The best results were obtained with alloys containing 1.8-2.5% Be and 3-5% Mn.

3C-250. Influence of Magnetic Field on the Electrical Resistance of a Manganese-Antimony Ferromagnetic Alloy. (In Russian.) I. G. Fakidov and N. P. Grazhdankina. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, June 11, 1949, p. 847-849.

The Thompson-Goldhammer effect was investigated for a Mn-Sb alloy containing 54 and 50 atomic % Sb. Method of investigation, including preparation of test specimens. 10 ref.

3C-251. Influence of the Size of Metallic Monocrystals on the Shape of the Elongation Diagram and on the Strength Decrease Caused by the "Adsorption Effect". (In Russian.) V. I. Likhtman and E. K. Venstrem. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, June 11, 1949, p. 881-883.

Effect of adsorption of surface-active agents investigated for monocrystalline tin wire from 0.4 to 2 mm. in diam.

3C-252. Changes in Electrical Resistance of "Superstructural" Alloys in a Longitudinal Magnetic Field. (In Russian.) R. G. Annaev. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, June 21, 1949, p. 1071-1074.

Results of a study of Thomson's galvanomagnetic effect and magnetic properties of a Ni-Mn alloy and their variation with time and temperature of annealing.

3C-253. Liquidus Temperatures and Liquid Densities of Zinc-Aluminum Alloys. I. S. Solet and Hillary W. St.Clair. *U. S. Bureau of Mines*, Report of Investigations 4553, Nov. 1949, 7 pages.

Methods used in measuring the above. 12 ref.

3C-254. On the Propagation of Large Barkhausen Discontinuities in Ni-Fe Alloys. L. J. Dijkstra and J. L. Snoek. *Philips Research Reports*, v. 4, Oct. 1949, p. 334-356.

Propagation of the Bloch boundary between two macro-domains un-

der the influence of an external magnetic field was investigated for Ni-Fe wires of 60-40 and 50-50 compositions subjected to tensile stress. Reviews various factors determining the shape of the boundary and its rate of propagation. Results lead to the concept that the movement of the boundary is impeded by two causes of different origin, the eddy-current effect and a spin-relaxation effect.

3C-255. The Thermal Conductivity of Lead and Tin in the Superconducting and in the Normal State. (In English.) A. Rademakers. *Physica,* v. 15, Oct. 1949, p. 849-859.

Pure samples of lead and tin were examined at temperatures between 1.4 and 4° K. Results are compared with those predicted by Heisenberg's theory.

3C-256. Sur l'oxydation du cerium et du lanthane. (Oxidation of Cerium and Lanthanum.) Jean Loriers. *Comptes Rendus* (France), v. 229, Sept. 12, 1949, p. 547-549.

The rate and course of oxidation were studied. Cerium is pyrophoric in character, but lanthanum is not, evidently because of formation of a protective oxide film.

3C-257. Champ coercitif et granulométrie du nickel Raney. (Coercive Force and Grain Size of Raney Nickel.) Louis Weil. *Comptes Rendus* (France), v. 229, Sept. 19, 1949, p. 584-585.

The coercive force of very fine ferromagnetic powder and of Ni reduced from oxalate or formate were previously found to decrease on increase of their densities by heating or compression. On the contrary, the coercive force of Raney nickel increased greatly, even up to three times, on application of such treatments. A theoretical explanation of the results.

3C-258. Field Dependence of Diamagnetism at Low Temperatures. (In English.) M. D. Shoenberg. *Bulletin de la Société Chimique de France,* July-Aug. 1949, p. D363-D364; discussion, p. D364-D365.

Compares results obtained by the author and other investigators for Bi, Zn, and Ga.

3C-259. Etude par la dureté de l'aptitude aux déformations plastiques et à l'écrouissage du zinc laminé à froid. (Study, by Means of Hardness Determination, of the Tendency Toward Plastic Deformation and Strain Hardening of Cold-Worked Zinc.) P. Bastien and A. Popoff, *Revue de Métallurgie,* v. 46, Sept. 1949, p. 583-593.

The empirical indexes of Meyer and Hargreaves, characterizing, respectively, the tendency toward strain hardening and plastic deformation of polycrystalline cold worked Zn, were determined under different conditions. Relationships between different factors involved.

3C-260. Frottement interne des alliages métalliques. (Internal Friction in Metallic Alloys.) Robert Cabarat, Léon Guillet, and René Le Roux. *Revue de Métallurgie,* v. 46, Sept. 1949, p. 622-626.

Effect of physicochemical constitution of a full range of Cu-Zn and Cu-Sn alloys on their modulus of elasticity and internal friction.

3C-261. Influence of Temperature on Mechanical Properties of Manganese. (In Russian.) E. M. Savitskii and V. F. Terekhova. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 1, 1949, p. 87-90.

Upon heating of Mn, certain modifications having a simpler structure, characterized by a smaller number of atoms in the unit cell, begin to predominate. This results in increased plasticity.

3C-262. Influence of Temperature on Surface Photo-Effect of Semiconductors. (In Russian.) A. N. Arsen'eva-Geil. *Doklady, Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 11, 1949, p. 245-247.

Determined for In, Se and Te. Comparison with a similar curve for silver.

3C-263. Level of Electrical Fluctuations in Certain Metals After Annealing. (In Russian.) E. Ya. Pumper. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 11, 1949, p. 277-279.

Experimental investigation showed an increase in the above (the Boltzmann constant) for certain metals, after annealing, up to a maximum in 7-8 days, followed by a gradual decrease to less than the initial value. A tentative explanation and use as the basis for a new method to study various processes in metals. Tabulated data for nichrome and a curve for tungsten.

3C-264. Electrocapillary Effect of a Decrease in Hardness of Metal. (In Russian.) E. K. Venstrem and P. A. Rebinder. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 11, 1949, p. 329-332.

The previously established relationship of hardness of metals to polarization was investigated for graphite, Tl, Zn, Pb, and Te. Curves of surface tension vs. hardness for these materials in several solutions.

3C-265. Cemented Titanium Carbide. John C. Redmond. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), p. 987-993.

Has transverse rupture strengths up to 175,000 psi. or 75% greater than previously reported. Either Co, Ni, or Fe may be used as an auxiliary metal. Addition of minor percentages of Ta carbide or of Cb and Ta carbide reduced the oxidation rate to very small values at temperatures up to 2200° F. 13 ref.

3C-266. Intergranular Parting of Brass During Anneals. F. H. Wilson and E. W. Palmer. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), p. 995-1003.

Details of extensive investigation of defect which is occasionally encountered in commercial fabrication of 70-30 brass. Shows that it has a structural appearance which can be duplicated by holding tensile specimens at a constant stress at elevated temperatures. Importance of grain size was demonstrated. Conclusions based on experimental work are in agreement with practical solutions to commercial problems. Recommendations for minimizing occurrence of the defect. 17 ref.

3C-267. The Low Temperature Properties of Tin-Antimony and Tin-Cadmium Alloys. F. J. Dunkerley, H. B. Hunter, and F. G. Stone. *Journal of Metals* (Transactions Sections), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), p. 1005-1016.

Tensile properties of 13 binary alloys containing 0.1-60% Cd and 0.1-10.43% Sb at six temperatures from −196 to +23° C. are presented and their variations rationalized in terms of microstructure. 12 ref.

3C-268. Hardness of Nickel Compacts. S. R. Williams. *Metal Progress,* v. 56, Dec. 1949, p. 811-813.

Results of a study of sintered nickel plates used in batteries. The ordinary hardness tester was found to be unsuitable, since the ratio of load to indentation was too small. A special tester was developed using the Ludwik cone indenter and a controlled load. Distinction between macro and microhardness testers, and use of a load criterion.

3C-269. Effects of Melting Atmosphere, Time at Temperature and Degasification on Properties of Valve Bronze. W. H. Baer and B. M. Loring. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 257-261; discussion, p. 261-262.

Previously abstracted from preprint. See item 2C-20, 1949.

3C-270. Melt Quality and Fracture Characteristics of 85-5-5 Brass. J. F. Ewing, C. Upthegrove, and F. B. Rote. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 433-447; discussion, p. 447-449.

Data obtained while developing a fracture-test procedure. Quality was evaluated on the basis of tensile strength, elongation, and density of test bars.

3C-271. Effect of Composition on Properties and Structure of Cast Monel. J. T. Eash and T. E. Kihlgren. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 535-544; discussion, p. 544-545.

Previously abstracted from preprint. See item 3C-68, 1949.

3C-272. Investigation of Constant of Anisotropy of Energy of Ternary Alloys of the System Ni-Cu-Mo. (In Russian.) N. S. Skulov, O. I. Blokhina, K. M. Bol'shova. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Aug. 1949, p. 865-870.

The influence of each element was investigated for multicomponent systems of Ni with nonferromagnetic elements. On the basis of previous investigations of binary alloys of Ni-Cu and Ni-Mo, the question of how the constant of anisotropy decreases in Ni-Cu-Mo alloys with increase of amount of Cu and Mo was solved. As a result, it is assumed that the above relationship has a universal character.

3C-273. Beitrag zu den magnetischen Eigenschaften und der Verwendbarkeit pulvermetallurgisch hergestellter Dauermagnete. (Magnetic Properties and Utility of Permanent Magnets Made by Powder Metallurgy.) Hermann Fahlenbrach. *Archiv für das Eisenhüttenwesen,* v. 20, Sept.-Oct. 1949, p. 301-304.

Theoretical considerations of the effects of various factors on the magnetic properties of AlNi and AlNiCo sintered alloys, and a comparison with measured magnetic properties. AlNiCo magnets with energy values of $3.0\text{-}3.8 \times 10^6$ gauss times oersted and thicknesses of 0.1-0.2 mm. can be made by the sintering process. 17 ref.

3C-274. Relation entre les moments et les points de Curie d'alliages isoélectroniques du groupe fer-cobalt-nickel. (Relation Between Moments and Curie Points of "Isoelectronic" Alloys of the Fe-Co-Ni Group.) Pierre Taglang. *Comptes Rendus* (France), v. 229, Oct. 10, 1949, p. 704-706.

A series of alloys having a constant number of electrons is designated as "isoelectronic" alloys. Method and apparatus for preparation and investigation of the alloys.

3C-275. Mesure de l'effet gyromagnétique d'alliages ferromagnétiques isoélectroniques. (Determination of Gyromagnetic Effect in "Isoelectronic" Ferromagnetic Alloys.) André J. P. Meyer. *Comptes Rendus* (France), v. 229, Oct. 10, 1949, p. 707-708.

Ferromagnetic alloys of the Fe-Co-Ni group, differing in chemical composition, but possessing the same average number of electrons and

crystallizing in same lattice, are distinguished by different atomic moments and Curie points. Attempts to prove R. Forrer's hypothesis by measurements of gyromagnetic effect using the Einstein-de Haas resonance method.

3C-276. Le champ coercitif des poudres ferromagnétiques. (Coercive Force of Ferromagnetic Powders.) Charles Guillaud. *Comptes Rendus* (France), v. 229, Oct. 24, 1949, p. 818-819.

Investigated for Mn-Sb in solid and powdered form. Observed variations are explained theoretically.

3D—Light Metals

3D-83. Relief of Residual Stress by a Single Fatigue Cycle. W. P. Wallace and J. P. Frankel. *Welding Journal*, v. 28, Nov. 1949, p. 565s.

Applied to a specimen of 61S Al alloy. Correlation of results with those of other investigators.

3D-84. L'endurance des métaux légers. (Fatigue Strength of Light Metals.) Raymond Boccon-Gibod. *Revue de l'Aluminium*, v. 26, Sept. 1949, p. 278-286.

Factors responsible for variation in fatigue strength; nonmetallic inclusions, pores and blowholes, heterogeneous grain structure, surface defects, stress concentrations related to shape of the part, etc.

3D-85. Über die technologischen Eigenschaften von Aluminium-Kupfer-Silizium-Magnesium-Gusslegierungen. (The Technological Properties of Aluminum - Copper - Silicon - Magnesium Cast Alloys.) Gustav Siebel. *Zeitschrift für Metallkunde*, v. 40, Sept. 1949, p. 349-354.

Effects of Mg, Si, Cu, Fe, and Mn on the strength properties of Alcoa 355 alloy (4.5-5.0% Si, 1.2-2.87% Cu, 0.4-0.6% Mg, 0-1.0% Mn, 0.6% Fe, 0.35% Zn, 0.2-0.25% Ti, 0-1.0% Ni, remainder Al). Uniformly high strength properties were obtained if the melts were degassed with chlorides, or if they were treated in a vacuum with chlorine. Heat treating was found to increase strength at the expense of elongation.

3D-86. Effect of Prestraining Temperatures on the Recovery of Cold Worked Aluminum. T. E. Tietz, R. A. Anderson, and J. E. Dorn. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 185), p. 921-926.

Mechanical properties of cold worked metals depend not only on instantaneous values of strain, strain rate and temperature, but on the entire past history of temperature and strain rate during prestraining. Observations appear to suggest that lower temperatures of prestraining induce formation of smaller or otherwise more readily activated dislocations.

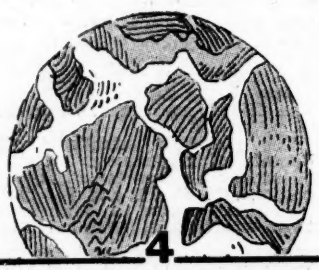
3D-87. Some Observations on the Recovery of Cold Worked Aluminum. T. V. Cherian, P. Pietrokowsky, and J. E. Dorn. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 185), p. 948-956.

Effects of recovery on various physical and mechanical properties have been extensively studied. Here effects on the true stress-strain curve were investigated. Effects of different temperatures and prestrains on 2S-O aluminum. Two types of recovery designated as "meta" and "ortho" were distinguished, indicating that the work hardened state is characterized by at least two essentially distinct types of imperfections. 16 ref.

3D-88. The Properties of Sand Cast Magnesium-Rare Earth Alloys. Thomas E. Leontis. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 185), p. 968-983.

Magnesium was alloyed with commercial Mischmetal, cerium-free Mischmetal, didymium, cerium, lanthanum, and praseodymium. Actual compositions of the materials (which were far from pure in any case). Structure and mechanical and physical properties of as-cast and heat-treated forms. 18 ref.

For additional annotations indexed in other sections, see:
2B-340-344-346-357-364; 4A-167; 4C-164; 4D-72; 9-326; 14C-103; 14D-69; 18B-234; 19D-67; 22A-282; 22B-433-472; 23B-62; 23C-79; 24A-161-167-169; 24D-29; 25C-75-76; 25D-40



4 CONSTITUTION and STRUCTURE

4A—General

4A-150. Fundamentals of the Working of Metals. Part V. General Nature of Phase Changes. George Sachs. *Modern Industrial Press*, v. 11, Nov. 1949, p. 6, 8, 50.

Elementary principles.

4A-151. Diffraction by a Screw Dislocation. A. J. C. Wilson and F. C. Frank. *Research*, v. 2, Nov. 1949, p. 541-543.

Calculations intended as an aid in verifying the hypothesis of dislocations which explains many of the properties of cold worked metals and the ease of crystal growth from vapor or solution.

4A-152. The Thermodynamics of the Iron-Nickel Alloys. O. Kubaschewski and Ortrud Von Goldbeck. *Transactions of the Faraday Society*, v. 45, Oct. 1949, p. 948-960.

Thermodynamic data for formation of gamma Fe-Ni alloys were derived from equilibrium measurements between H_2O, H_2, and alloys of various compositions. Corresponding data for the alpha phase were derived from published work on heat content measurements. Thus free-energy curves were calculated and their accuracy estimated. From these curves, phase boundaries were derived. 19 ref.

4A-153. Isothermal Compositional Order-Disorder. I. Superstructure Solid Solutions in a Salt System. Alexander Grenall. *Journal of Chemical Physics*, v. 17, Nov. 1949, p. 1036-1043.

Solid solutions in the system, NH_4Cl-$MnCl_2$-H_2O, exhibit properties characteristic of order-disorder in alloys. The salt system's features resemble those of a low-temperature isotherm across Shockley's theoretical phase diagram for alloy order-disorder transformation. Phenomena in metal and salt systems were further shown by producing the disordered state from the ordered by thermal and cold-working methods. In both instances, order was spontaneously restored on aging at room temperature. 23 ref.

4A-154. Sur les relations entre les textures de laminage et de recristallisation. (Concerning Relationships Between Rolling Structures and Recrystallization.) P. Coheur and J. M. Lejeune. *Revue de Métallurgie*, v. 46, July 1949, p. 439-444; discussion, p. 445.

Study of above, using aluminum, verifies the hypothesis of Burgers, according to which the recrystallization structure is due to nuclei formed by crystal fragments undetected by X-rays. Such nuclei possess in deformed metal the same orientation as observed during recrystallization. Secondary recrystallization seems to depend on thickness of the test specimens. Includes pole-figure diagrams and graphs. 11 ref.

4A-155. La valence des métaux et la structure des composés intermétalliques. (Valency of Metals and Structure of Intermetallic Compounds.) Linus Pauling. *Journal de Chimie Physique et de Physico-Chimie Biologique*, v. 46, May-June 1949, p. 276-284; discussion, p. 284-287.

Recent progress in study of fundamental electronic structure and atomic dimensions.

4A-156. Über die Zellenunterteilung dendritischer Gusskörner. (Cellular Subdivisions in Dendritic Cast-Metal Grains.) Hans Kostron. *Zeitschrift für Metallkunde*, v. 40, Sept. 1949, p. 321-332.

Shows that dendritic grains are composed of cells. Intermetallic compounds usually segregate along grain and cell boundaries. Since arrangement of these compounds greatly affects properties of the worked and unworked castings, author proposes that not only the grain sizes but also the cell sizes be determined. Two methods of determining average cell sizes are indicated. 19 ref.

4A-157. Die Verfestigung bei intermetallischen Phasen und Salzkristallen. (Hardening in Intermetallic Phases and Salt Crystals.) Ludwig Graf. *Zeitschrift für Metallkunde*, v. 40, Sept. 1949, p. 334-338.

Possible reasons for the absence of plasticity or slip in salts and intermetallic compounds at temperatures of atomic immobility. The effect of different noninterchangeable atom types in the lattice and of processes within the slip plane are theoretically examined. 16 ref.

4A-158. Determination of the Coefficient of Diffusion in Case of a Low Concentration of Diffusing Substance. (In Russian.) B. Ya. Lyubov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, June 21, 1949, p. 1117-1120.

Proposes an equation assuming that the relationship of diffusion coefficient to concentration is linear in character. As an example, the diffusion coefficient of carbon into gamma iron was determined.

4A-159. Concerning the Problem of Crystallization of Metallic Melts. (In Russian.) V. I. Likhtman and B. M. Maslennikov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, July 1, 1949, p. 93-95.

Results of investigation indicate that, during crystallization of the metallic melt, the most important factor is "collective recrystallization" on the solid-liquid boundary. All of the methods for production of metallic monocrystals from melt or after plastic deformation have, as their basis, the process of "collective re-

crystallization" and are not affected either by heat transfer or by mold shapes.

4A-160. The Beryllium-Iron System. Robert J. Teitel. *U. S. Atomic Energy Commission*, AECD-2251, Apr. 1948, 89 pages.

See abstract from *Journal of Metals*, item 4A-39, 1949.

4A-161. An Elastic Theory of Dislocations. Elizabeth H. Mann. *Proceedings of the Royal Society*, ser. A, v. 199, Nov. 7, 1949, p. 376-394.

Theory for the internal stresses caused by slip in crystalline materials is based on the concept of dislocations as they occur in the mathematical theory of elasticity, and on the work of Volterra. General formulas are derived for calculating stresses corresponding to given dislocations. Four examples involving plane and screw dislocations in circular cylinders are solved. Relations between mathematical dislocations and some simple types of slip in crystals.

4A-162. Iron-Nickel System; Further X-Ray Study of the Equilibrium Diagram. E. A. Owen. *Iron and Steel*, v. 22, Nov. 22, 1949, p. 548-550; discussion, p. 603-605.

Previously abstracted from *Journal of the Iron and Steel Institute*. See item 4A-124, 1949.

4A-163. Microscopical Studies on Fe-Ni-Al System. Part I. $\alpha + \beta$ Alloys and Isothermal Sections of the Phase Equilibrium Diagram. A. J. Bradley. *Iron and Steel*, v. 22, Nov. 22, 1949, p. 553-558; discussion, p. 603-605.

Previously abstracted from *Journal of the Iron and Steel Institute*. See item 4C-110, 1949.

4A-164. Fe-Ni-Cr Alloys; Constitution at 650° to 800° C. W. P. Rees, B. D. Burns, and A. J. Cook. *Iron and Steel*, v. 22, Nov. 22, 1949, p. 559-564; discussion, p. 603-605.

Previously abstracted from *Journal of the Iron and Steel Institute*. See item 4A-123, 1949.

4A-165. Superestruturas de Estado Cristalino. (Superstructures of the Crystalline State.) Francisco F. Pereira Pinto. *Boletim da Associaçao Brasileira de Metais*, v. 5, July 1949, p. 285-312.

Formation of superlattices was investigated theoretically and experimentally. For the latter, the alloys FeAl, Fe_3Al, and Cu_3Au were studied by X-ray diffraction. 18 ref.

4A-166. A Proposed Microbending Mechanism of Plastic Deformation. M. K. Yen. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 185), p. 1003-1004.

15 references.

4A-167. Trick Metals To Improve Steel. J. C. Feinberg. *Science News Letter*, v. 56, Dec. 10, 1949, p. 378-379.

Outlines work of Andrade on single crystals of metals. Peculiar mechanical and structural characteristics are explained on the basis of surface imperfections.

4A-168. Investigation of the Forms of Primary Crystallization in Metallic Alloys. (In Russian.) D. A. Petrov and A. A. Bukhanova. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Chemical Sciences), July-Aug. 1949, p. 396-408.

Dependence on temperature. A direct relationship between external form of crystals and their lattice structure was established. The formation of skeleton and dendrite forms is said to be related to the dissimilar surface energies of individual crystal elements (apex, ribs, and grains).

4B—Ferrous

4B-133. Ingot Iron Inside Out. Carl A. Zapffe and C. O. Worden. *Metal Progress*, v. 56, Nov. 1949, p. 672-673.

"Obverse and reverse" patterns of a single cleavage traverse through an individual grain of ingot iron. Each view illustrates the cleavage pattern of hydrogen-embrittled iron. Numerous voids of sharply rectilinear outline are believed to be the micelles postulated by Zapffe in his new theory for the solid state.

4B-134. Austenite Transformation in the Hardenable Chromium Stainless Steels. (In English.) Paul S. Spencer and S. W. Poole. *Metalen*, v. 4, Sept. 1949, p. 1-9.

Effects of isothermal transformation on a series of stainless steels were determined by metallographic examination and hardness tests. Transformations were allowed to occur isothermally at temperature levels which would produce a soft ferrite-carbide type of structure and also at intermediate temperatures where little if any transformation occurs. Suggests practical application to the annealing of small forgings produced from AISI 410, 416, 420, and 440 types.

4B-135. Causes of Different Influences of Alloying Elements on the Eutectic Point, Dissociation of Austenite, and on the Critical Rate of Tempering of Steel. (In Russian.) M. E. Blanter. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, July 1, 1949, p. 109-112.

Proposes a series of equations relating different factors involved in the above problem. Analysis of these equations for different values of variables gives a clue for solution. Obtained theoretical data are in close agreement with results of experimental investigation.

4B-136. Fe-Ni and Fe-Mn Systems; Free Energy and Metastable States. F. W. Jones and W. I. Pumphrey. *Iron and Steel*, v. 22, Nov. 22, 1949, p. 550-553; discussion, p. 603-605.

Previously abstracted from *Journal of the Iron and Steel Institute*. See item 4B-114, 1949.

4B-137. Constitution Diagram for Stainless Steel Weld Metal. Anton L. Schaeffler. *Metal Progress*, v. 56, Nov. 1949, p. 680, 680B.

The tentative constitution diagram has been revised to improve its accuracy in estimating the microstructure of a stainless-steel weld deposit on the basis of chemical composition. Microstructure of the more common types including those containing Mo and Cb.

4B-138. Vlocky v ocelich. (Flaking in Steels.) Frantisek Kinsky. *Hutnické Listy*, v. 4, July 1949, p. 201-210; Aug. 1949, p. 241-246; Sept. 1949, p. 277-284.

Theoretical and practical analysis of flaking caused by the presence of hydrogen, but affected by other factors. Recommendations for avoidance or minimization of flaking. 25 ref.

4B-139. Metallographic Technique for Steel: Etching Action of Nital and Picral. *Metal Progress*, v. 56, Dec. 1949, p. 832B.

Twelve photomicrographs show microstructures of different phases as revealed by these etchants.

4B-140. Note on As-Cast Structure and Grain Size in Cast Alloy Steels. Edward A. Loria. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 588-595; discussion, p. 595-596.

Previously abstracted from preprint. See item 4B-40, 1949.

4B-141. Effects of Various Deoxidizers on the Structures of Sulphide Inclusions. C. E. Sims, H. A. Saller, and F. W. Boulger. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 233-247; discussion, p. 247-248.

Previously abstracted from preprint. See item 4B-39, 1949.

4B-142. Activities of Carbon and Oxygen Dissolved in Liquid Iron. (In Russian.) A. M. Samarin and L. A. Shvartsman. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Aug. 1949, p. 1231-1234.

Investigation shows that the thermodynamic behavior of carbon, dissolved in liquid iron, is similar to its behavior in austenite. Deviations from ideality in behavior of oxygen dissolved in liquid iron containing carbon are explained on the basis of the assumptions of Bachinskii concerning free space in a liquid.

4C—Nonferrous

4C-148. Microstructure of Uranium. H. P. Roth. *Metal Progress*, v. 56, Nov. 1949, p. 662-663.

Six micros show structures as rolled at 500° C.; extruded and annealed (three variations); rolled and annealed (two variations).

4C-149. Electron Micrographs of Tungsten. Laurence Delisle. *Metal Progress*, v. 56, Nov. 1949, p. 670-671.

A particle of tungsten powder, sections from annealed and as-drawn wire, and grain boundaries in tungsten rod.

4C-150. The Effect of Cold Work in Metals on Powder Pattern Intensities. B. L. Averbach and B. E. Warren. *Journal of Applied Physics*, v. 20, Nov. 1949, p. 1066-1069.

Using crystal monochromated Cu Kα-radiation and a Geiger counter spectrometer, integrated intensity measurements were made for powder samples of cold-worked and annealed α-brass. Measurements were made of the (400) reflection of cold-worked samples and of an annealed sample held at high temperature to demonstrate the difference between effects of cold work and temperature vibration.

4C-151. Inverse Segregation in Nonferrous Alloys. Part II. W. T. Pell-Walpole. *Metal Treatment and Drop Forging*, v. 16, Autumn 1949, p. 171-182; advertising section, p. 52.

Major theories of mechanism and causes are reviewed in the light of known facts concerning this phenomenon. 58 ref.

4C-152. La recristallisation isotherme. (Isothermal Recrystallization.) P. Laurent, M. Eudier, and M. Batisse. *Revue de Métallurgie*, v. 46, July 1949, p. 446-451; discussion, p. 451-452.

Theoretically investigated for aluminum (99.4%) and brass. Theories of Krapkowski and Balicki, Cook and Richards, Johnson and Wehl, and Burgers.

4C-153. Zur Konstitution der Wismut-Antimon-Legierungen. (The Constitution Diagram of Bismuth-Antimony Alloys.) Georg Masing, Paul Rahlfs, and Werner Schaarwächter. *Zeitschrift für Metallkunde*, v. 40, Sept. 1949, p. 333-334.

Resistance measurements made to determine the melting point of homogenized specimens indicate a correction of the Bi-Sb diagram by raising the solidus curve to slightly higher temperatures.

4C-154. Mangan-Silber. Mangan-Gold. (Manganese-Silver, Manganese-Gold.) E. Raub. *Zeitschrift für Metallkunde*, v. 40, Sept. 1949, p. 359-360.

Constitution diagrams plus brief description.

4C-155. Influence of Small Additions of Antimony on the Frontal Diffusion of Silver Into Polycrystalline Copper. (In Russian.) V. I. Arkharov and T. Yu. Gol'dshtein. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, June 21, 1949, p. 1113-1115.

4C-156. Recrystallization of Single Crystals After Plastic Bending. R. W. Cahn. *Journal of the Institute of Metals*, v. 76, Oct. 1949, p. 121-143.

Experiments to find out how to produce in deformed crystals a special type of recrystallization which leads to discontinuous asterisms in the Laue patterns. Bent single crystals are particularly liable to this type of recrystallization, which has been observed with Zn, Mg, Al, and rock-salt. Systematic experiments with Zn crystals established an optimum bending radius, annealing time, and annealing temperature. Microstructures of bent and of annealed specimens, and theory of the phenomenon. 36 ref.

4C-157. The Equilibrium Diagram of the System Chromium-Manganese. S. J. Carlile, J. W. Christian, and W. Hume-Rothery. *Journal of the Institute of Metals*, v. 76, Oct. 1949, p. 169-194.

Determined for the whole range of compositions above 1000° C. and for the range 60-100 atomic % Mn at lower temperatures. 12 ref.

4C-158. A Note on the Effect of Nitrogen on the Structures of Certain Alloys of Chromium and Manganese, and on the Existence of an Intermediate Nitride Phase. S. J. Carlile and W. Hume-Rothery. *Journal of the Institute of Metals*, v. 76, Oct. 1949, p. 195-200.

When alloys were annealed above 1000° C. in mullite tubes filled with argon, a new nitride phase was formed. Photomicrographs show growth of this nitride phase and its development of acicular structures. An X-ray diffraction photograph suggests that the phase is a new substance, possibly of the formula $(CrMn)_4N$.

4C-159. Étude dilatométrique de la transformation ordre ⇄ désordre dans les ferronickels voisins de Ni_3Fe. (Dilatometric Study of the Order-Disorder and Reverse Transformations in Ferronickels Close to the Composition Ni_3Fe.) Emile Josso. *Comptes Rendus* (France), v. 229, Sept. 19, 1949, p. 594-596.

Data on a series of specimens containing 70-80% Ni.

4C-160. La détermination de la phase Co_7Mo_6. (Determination of the Phase Co_7Mo_6). E. Henglein and H. Kohsok. *Revue de Métallurgie*, v. 46, Sept. 1949, p. 569-571.

X-ray diagrams and table, comparing calculated and observed intensities in the powder pattern of the above phase. Results prove the existence of this phase, and its crystal dimensions are given.

4C-161. Variation of Boundary Solubility of Solid Metals Under the Influence of Multilateral Compression. (In Russian.) M. I. Zakharov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 1, 1949, p. 69-71.

The concentration of solid solution in equilibrium under compression changes slowly over periods from 2 hr. up to several days. Rate of attainment of equilibrium varies with temperature. Data for Zn in Cu, Al in Cu, and Cu in Al.

4C-162. Investigation of the Mn-Ni System. (In Russian.) N. N. Kurnakov and M. Ya. Troneva. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 1, 1949, p. 73-76.

Investigated by means of dilatometric studies and changes in electrical resistance, particularly the solid-state transformation in the Mn-rich zone. 18 ref.

4C-163. The Effect of Working and Heating Eutectic Structures. J. S. Brown and A. G. Guy. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 185), p. 933.

Results for the Pb-Mg eutectic containing 33.2% Mg, showing conditions as cast, after 70% compression, and after heating the compressed specimen 1 hr. at 850° F. Similar results obtained with other eutectics indicate that eutectic structures can be recrystallized into a "spheroidized" condition by heating near the eutectic temperature after severe deformation.

4C-164. Investigation of the Structure of Fe-CoAl-NiAl Alloys. (In Russian.) O. S. Ivanov and M. S. Skryabina. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Chemical Sciences), July-Aug. 1949, p. 337-342.

Data presented are of value in the study of highly coercive alloys. Difference in influence of Al on ferromagnetism of the solid solution in the absence and in the presence of Co and Ni. This difference is explained by the presence of "molecules" of CoAl and NiAl inside the ternary and quaternary solid solutions. Method of investigation.

4C-165. Note on the Structure of Uranium. (In English.) Joseph S. Lukesh. *Acta Crystallographica*, v. 2, Dec. 1949, p. 420.

Lattice-dimension data of other investigators for the alpha form were confirmed by use of single crystals.

4D—Light Metals

4D-70. L'évolution structurale des alliages Aluminium-Cuivre 4% trempés. Le phénomène de réversion. (Structural Transformation of Aluminum Alloys Containing 4% Copper. The Phenomenon of Reversion.) Adrien Salunier. *Revue de l'Aluminium*, v. 26, July-Aug. 1949, p. 235-238.

Phenomena accompanying room-temperature and artificial aging which take place after quenching. Reversion softens the alloy (whereas artificial aging conducted immediately after quenching hardens it slightly) because prior aging has caused formation of high latent-energy zones allowing partial recrystallization. A new heat treatment—interrupted artificial aging—may be useful for reversion in numerous industrial applications.

4D-71. Structure of Certain Al-Mg Alloys. (In Russian.) E. M. Savitskii and M. A. Tylkina. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, July 1, 1949, p. 81-83.

An observed anomaly in the variation of properties of Al-Mg alloys was investigated by means of X-ray and microstructural analysis to determine its causes. Quenching deformed specimens from 400° C. in ice water indicated existence of a single-phase structure between 38.9 and 41.3% Mg, contrary to previous literature data.

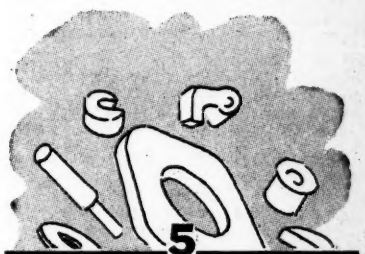
4D-72. Les gaz dans l'Aluminium et ses alliages. (Gases in Aluminum and Its Alloys.) R. Castro and M. Armand. *Revue de Métallurgie*, v. 46, Sept. 1949, p. 594-616.

Critical survey of the literature with emphasis on the Al-H_2 system. State of gas in aluminum; effect on properties of the metal; origin of the gas in the metal; methods for control of gas content; and methods for counteracting harmful effects of gas present. 131 ref.

4D-73. Physicochemical Investigation of Al-Si-Li Alloys. (In Russian.) E. A. Boom. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, Aug. 11, 1949, p. 871-874.

The nature of the modification of alloys of the "silumin" type (Al + 5-13% Si) caused by addition of a small amount of Li (up to 1%) was investigated, particularly the mechanism of diffusion of Li into the alloy. Obtained data show the presence of a new phase, which is assumed to be a ternary lithium silicide, Li_2AlSi_2. This assumption was confirmed by chemical analysis. Mechanical properties of this phase.

For additional annotations indexed in other sections, see:
2B-340-344-357-358; **3A**-244-245-247-252-254; **3B**-273-274-275; **3C**-261-266-267; **3D**-88; **6B**-189; **10B**-104; **11**-369-376-378-385-388-393-395-398; **13**-73; **14B**-163; **18B**-230-239; **19B**-234; **22A**-280



5A—General

5A-64. New Trends in Powder Metallurgy. *Chemical Age*, v. 61, Nov. 5, 1949, p. 631-633.

Reviews Swiss and Czechoslovak modifications and development of nonporous compacts on the basis of recent patent literature.

5A-65. Powder Metallurgy in Germany. *Metal Progress*, v. 56, Nov. 1949, p. 736, 738. Condensed from "Powder Metallurgy in Germany During the Period 1939-1945", by R. A. Hetzig, H. M. Stationary Office, London, 1949. (BIOS Overall Report No. 20.)

Previously abstracted from original. See item 5A-44, 1949.

5A-66. Relationship of Mechanical Properties of Metals Produced by Powder Metallurgy to Porosity and Overall Properties of Porous Powdered-Metal Compacts. (In Russian.) *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, Aug. 11, 1949, p. 831-834.

Proposes formula for the above, based on the assumption that the index of the mechanical strength of such metals, in the first approximation, is a constant of the material independent of its porosity and that the compressibility is also a factor in the mechanical strength index.

5C—Nonferrous

5C-26. A Study of the Mechanism of Sintering of Metallic Particles. J. H. Dedrick and A. Gerds. *Journal of Applied Physics*, v. 20, Nov. 1949, p. 1042-1044.

Single layers of spherical copper particles were sintered under varying conditions of time and temperature in a dry hydrogen atmosphere. Analysis of the rate of interface contact between the particles shows metallic sintering to be a diffusion process. Heat of activation of self-diffusion of Cu was calculated.

5C-27. Molybdenum; Production, Properties and Applications. G. L. Miller. *Metal Industry*, v. 75, Nov. 11, 1949, p. 411-413.

Two methods for production of Mo ingots, in one case up to 250 lb. in weight. Both methods are based on powder metallurgy. Photomicrographs show typical microstructures of Mo processed in different ways.

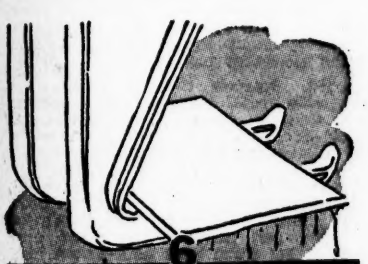
5C-28. The Formation of Alloys by Diffusion in Powder Metallurgy. Pol Duwez. *Powder Metallurgy Bulletin*, v. 4, Oct. 1949, p. 144-156.

The homogenization of compacts made of Cu-Ni, Cu-Zn, and Cu-Sn was studied by X-ray diffraction and by recording the thermal expansion measurements. For the Cu-Ni compacts, the thermal expansion curve is similar to that of a pure metal during sintering. The Cu-Zn and Cu-Sn compacts exhibit abnormal expansions which are related to the presence of intermediate phases during diffusion. (To be concluded.)

5C-29. Sintered Products: Developments in Powder-Metallurgy; Porous-Metal De-Icer Panels. *Aircraft Production*, v. 11, Dec. 1949, p. 424-425.

System in which de-icing fluid is distributed at the leading edge through bars of porous metal. An 89-11 bronze is used. Other applications such as fuel filters are suggested. The powder is available in five particle-size ranges.

For additional annotations indexed in other sections, see:
3C-268-273



6A—General

6A-156. Fluorine Versus Construction Materials. *Chemical Engineering*, v. 56, Nov. 1949, p. 201-202.

A symposium in which several manufacturers of construction materials evaluate their products for services involving fluorine. Consists of the following: "Carbon and Graphite", J. F. Revilock and N. J. Johnson; "Stainless Steel", W. G. Renshaw; "Lead", Kempton H. Roll; "Iron and Steel", A. W. Spitz; and "Worthite", W. E. Pratt. Also includes statements of F. E. Herstein, Allan L. Percy, and Ellis D. Verink concerning chemical stoneware, tantalum, and aluminum. These materials are not recommended for fluorine service.

6A-157. Corrosion Problems in the Pulp and Paper Industry. Roy P. Whitney. *Corrosion*, v. 5, Dec. 1949, p. 435-439.

General problems and difficulties specific to sulfite pulping, alkaline pulping, bleaching, and papermaking. Recommendations for choice of alloys.

6A-158. Plant Corrosion in the Fatty Acid Industry. R. J. Paul. *Corrosion*, v. 5, Dec. 1949, p. 439-442.

Older materials used for equipment, pumps, and piping and new material applications. Relative suitability of materials is indicated by the results of operating specific equipment under plant conditions. 14 ref.

6A-159. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry*, v. 41, Dec. 1949, p. 79A-80A.

Developments of the past few years in metals and alloys for combating corrosion.

6A-160. The Corrosion of Metals. W. H. J. Vernon. *Journal of the Birmingham Metallurgical Society*, v. 29, Sept. 1949, p. 131-152.

Economics, theory, testing, and prevention. 41 ref.

6A-161. Phénomènes periodiques dans la corrosion des métaux par les vapeurs. (Periodic Phenomena in Corrosion of Metals by Vapors.) René Dubrisay. *Comptes Rendus* (France), v. 229, Oct. 24, 1949, p. 829-831.

On placing a fragment of iodine on silver foil, Fizeau observed formation of a series of concentric colored rings. This phenomenon was studied experimentally and theoretically. A formula is developed for determining thickness of the iodide film for a given distance from the fragment.

6A-162. Costs of Corrosion Control. W. H. J. Vernon. *Canadian Metals and Metallurgical Industries*, v. 12, Nov. 1949, p. 24-25, 34-36.

16 references.

6B—Ferrous

6B-181. Corrosion par discontinuité superficielle des alliages de métaux ferreux. (Expériences.) (Experiences With Corrosion of Ferrous Metals Caused by Surface Irregularities.) R. Binaghi. *Métaux & Corrosion*, v. 24, Sept. 1949, p. 216-222.

Experimental investigation of 10 alloy steel and 14 toolsteel specimens of varied composition. Effects of composition, heat treatment, passivation, and discontinuity of conditions. 16 ref.

6B-182. Das elektrochemische Verhalten und die Bildungsgeschwindigkeit von Oxydhäuten auf Metalloberflächen, insbesondere Eisen. (The Electrochemical Behavior and the Rate of Formation of Oxide Films on Metal Surfaces, Especially Iron.) Fritz Tödt. *Metalloberfläche*, v. 3, sec. A, Sept. 1949, p. A170-A173.

Electrochemical and chemical methods of determining the thickness of oxide films on iron and other metal surfaces as well as the rate of formation of iron oxide films. Quantitative comparison with the rate of formation of halide films. Measurements show considerable differences in galvanic effects between the oxide film and the exposed surface of pure metallic iron, soft iron, and hard iron.

6B-183. Correlation Between Corrosion Survey Results and Actual Conditions as Determined Through 130 Miles of Continuous Reconditioning. I. B. Tietze. *Corrosion*, v. 5, Dec. 1949, p. 409-415.

Results obtained on a petroleum-products pipeline.

6B-184. Cathodic Protection of Marine Tractor. Oliver Osborn. *Corrosion*, v. 5, Dec. 1949, p. 416.

6B-185. Marine Boiler Deterioration. I. G. Slater and N. L. Parr. *Corrosion*, v. 5, Dec. 1949, p. 417-434.

See abstract of condensed version from *Engineer*, item 6B-47, 1949.

6B-186. Field and Laboratory Tests of Sodium Chromates and Alkalies for Controlling Corrosion in Gas Condensate Wells. Part 6. (Concluded.) C. K. Eilerts, R. V. Smith, F. G. Archer, L. M. Burman, Faye Greene, and H. C. Hamontre. *World Oil*, v. 129, Dec. 1949, p. 160-162, 164, 166, 168.

Characteristics of a chromic oxide deposit found in the tubing collars of wells in the 3000-7100 ft. zone and also as a continuous internal coating below this level. Investigation of physical texture and composition, and solvent tests on this material indicate that 15% HCl will remove deposits of reduced chromates. Analysis of costs of chromate treatment.

6B-187. Corrosion and Incrustation in Return Systems. H. M. Schudlich, chairman. *American Railway Engineering Association*, Bulletin, v. 51, Nov. 1949, p. 150-154.

Causes and remedies for the above which occurs in steam-heating system return pipes.

6B-188. Corrosion Inhibitive Action of Zinc Compounds. J. E. O. Mayne. *Journal of the Society of Chemical Industry*, v. 68, Sept. 1949, p. 272-274.

Experimental results for three zinc dusts, three zinc oxides, other zinc compounds, and pigments based on Pb and Ti applied to steel. Zn dust provides cathodic protection, but ZnO does not.

6B-189. Les figures de corrosion dans les ferro-siliciums. (Corrosion Patterns in the Iron-Silicon Alloys.) A. Antonioli and A. Ferri. *Revue de Métallurgie*, v. 46, Sept. 1949, p. 627-636; discussion, p. 636.

A new microscopic method for determination of the orientation of grains and for measurement of the electrolytic solution potential of monocrystals of different orientations. The alloy investigated contained about 4% Si. The possibility of explaining the corrosion pattern on the basis of the distribution of values of potential in grains of different orientations in polycrystalline materials is suggested. 25 ref.

6B-190. Über das anodische Verhalten des Eisens in Schwefelsäure. (The Anodic Behavior of Iron in Sulfuric Acid.) Ulrich Frohwalt Franck. *Zeitschrift für Naturforschung*, v. 4a, Aug. 1949, p. 378-391.

Electrochemical reactions of anodic passivation and activation of Fe in H_2SO_4. A proposed explanation of the anodic passivation mechanism is based on passivation time in relation to anodic current density and flow of the electrolyte. 33 ref.

6B-191. Zur Kenntnis des Angriffs von vanadiumhaltigen Oelaschen auf hitzebeständige Stähle. (The Attack of Vanadium-Containing Oil Residues on Heat Resistant Steels.) P. Schläpfer, P. Amgwerd, and H. Preis. *Schweizer Archiv für angewandte Wissenschaft und Technik*, v. 15, Oct. 1949, p. 291-299.

Experiments at 650-850° C. show that vanadium-containing fuel oils greatly accelerate the scaling of heat resistant steels if the temperature

is above the melting point of the mineral residue, that the rate of attack increases with temperature, and that it is proportional to quantity of reacting material and to exposure time. Alkali in the residue also affects the rate of attack, but no attack occurs in a reducing atmosphere. Mechanism of attack.

6B-192. Mechanism of the Chromate Inhibition of Aqueous Corrosion of Iron. Influence of $K_2Cr_2O_7$ Additions to Water on the Electrode Potential of Iron. Influence of $K_2Cr_2O_7$ Additions to Water on the Rate of Electrode Processes. (In Russian.) I. L. Rozenfel'd and G. V. Akimov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, Aug. 1, 1949, p. 667-669; Aug. 11, 1949, p. 879-882.

Experimental results indicate that potassium dichromate, to a much higher degree than other inhibitors, causes displacement of the initial potential in the positive direction; also that differences of electrode potentials of iron in plain water and in water containing $K_2Cr_2O_7$ increase considerably with time. These phenomena indicate that the mechanism of the action of dichromate consists of strong inhibition of the anodic process. The cathodic process is also inhibited; however, this effect is smaller than the anodic effect.

6B-193. Oxidation of Iron in the Range 100-400° C. Investigations at Cambridge. U. R. Evans. **Investigations at Teddington.** W. H. J. Vernon, T. J. Nurse, C. J. B. Clews, and E. A. Calnan. *Nature*, v. 164, Nov. 26, 1949, p. 909-911.

Results obtained independently at two British laboratories. Although the methods employed have been different, the two sets of results are essentially complementary.

6B-194. Corrosion Mitigation Within Dehydrating Tanks. Ernest O. Kartinen. *Oil and Gas Journal*, v. 48, Dec. 8, 1949, p. 82, 84.

Deals only with the most troublesome type of the above corrosion: that which occurs in the water-exposed areas of dehydrating tanks, and, to a lesser degree, in some stock tanks. Use of coatings and magnesium-anode systems. The latter are recommended.

6B-195. Influence of Oil in Subsurface Corrosion of Oil-Well Equipment. Walter F. Rogers. *Oil and Gas Journal*, v. 48, Dec. 15, 1949, p. 73-75, 79.

Ability of oils to wet steel in the presence of the water produced. Oils vary widely in their tendency to wet and protect steel. A method was developed for surveying tubing to determine the presence of oil films in place for the purpose of correlating oil drop-size ratio, surface oil films and corrosion history. Wetting agents are now being used commercially to develop surface oil films on steel and reduce corrosion rates.

6C—Nonferrous

6C-82. Über den Angriff von Zink durch heisses Leitungswasser. (The Corrosion of Zinc by Hot Tap Meter.) Gerhard Schikorr. *Zeitschrift für Metallkunde*, v. 40, Sept. 1949, p. 344-348.

Effects of four types of water at 70° C. and of different influencing factors on rate of corrosion of sheet zinc. Experimental procedures and results.

6C-83. Materials for Bromine Containers. George S. Haines. *Industrial and Engineering Chemistry*, v. 41, Dec. 1949, p. 2792-2797.

Nickel and monel were found to be satisfactory container materials for dry bromine. Teflon is resistant to attack by bromine and is suitable as a gasket material.

6C-84. Resistance Alloys (Ni-Cr Type). *Metal Progress*, v. 56, Dec. 1949, p. 866, 868. Translated and condensed from "The Effect of Additions on the Oxidation of Nickel and Chromium-Nickel Alloys", by Lore Horn, *Zeitschrift für Metallkunde*, v. 40, Feb. 1949, p. 73-76.

Previously abstracted from original. See item 6C-29, 1949.

6D—Light Metals

6D-34. The Effect of Minor Alloying Elements on the Rate of Dissolution of Aluminum in Bases. M. E. Straumanis. *Journal of the Electrochemical Society*, v. 96, Nov. 1949, p. 310-317.

Dissolution rate of aluminum in 0.5*N* NaOH, $Ba(OH)_2$, and NH_4OH is increased by addition of several minor alloying elements, especially by those of low hydrogen overvoltage, e.g., Pt, Fe, and Cu. Rate of solution of aluminum is shown to be proportional to log of concentration in % by weight of alloying element up to 5%. The effect of alloying elements with high hydrogen overvoltage is entirely different. Zn, Cd, and Pb slightly increase the rate of dissolution of aluminum. Bi does not influence the rate, and Sn and Sb retard it. 12 ref.

6D-35. Influence de la contamination superficielle sur la corrosion des toles en alliage de Magnésium et de Manganèse. (Effect of Surface Contamination on the Corrosion of Magnesium-Manganese Alloy Sheets.) L. Rakowski. *Métaux & Corrosion*, v. 24, Sept. 1949, p. 193-210.

Experimental investigation indicates that difficulties encountered during chromizing of DTD 118 alloy sheets are caused by surface contamination and heterogeneity of the alloy surface. Methods of avoiding such difficulties. Effects of different corrosive media on specimens prepared in different ways.

6D-36. Problèmes de Corrosion que pose l'emploi des alliages de Magnésium en construction aéronautique. (Corrosion Problems Arising From the Use of Magnesium Alloys in Airplane Construction.) L. F. Le Brocq and H. G. Cole. *Métaux & Corrosion*, v. 24, Sept. 1949, p. 211-215.

Magnesium alloys widely used in airplane construction are generally protected by surface treatment (chromizing) or by corrosion resistant paints. However, certain cases where considerable corrosion may take place were investigated and remedies proposed.

6D-37. Étude des couches d'Alumine déposées sur l'Aluminium par oxydation anodique. (Study of Layers of Alumina Deposited on Aluminum by Anodic Oxidation.) J. J. Trillat and R. Tertian. *Revue de l'Aluminium*, v. 26, Oct. 1949, p. 315-319.

Four samples of high-purity (99.99%) Al were anodized in a sulfuric acid bath. Two of the samples were sealed to prevent further oxidation and two were not. The character of the oxide films was studied by X-ray and electron diffraction. No difference between sealed and unsealed films was detected. Progressive pickling of thick films seems to indicate that the superficial texture of the oxide does not extend to the deeper layers which are amorphous in character.

6D-38. Untersuchungen über Korrosionsangriffe in Kohlendioxyd-Drukgefässen aus Aluminiumlegierungen. (Research on Corrosive Attack on Aluminum Alloys in Carbon Dioxide Containers.) P. Schläpfer, H. Gäumann, and A. Bukowiecki. *Schweizer Archiv für angewandte Wissenschaft und Technik*, v. 15, Oct. 1949, p. 316-324.

Neither liquid nor gaseous CO_2, even when saturated with water, reacts with the inside walls. Corrosion in practice is explained by the action of $Al(OH)_3$ dissolved in the water present in the vessel as a separate phase. 20 ref.

6D-39. Prevention of Stress-Corrosion Cracking in Service. Edgar H. Dix, Jr. *Metal Progress*, v. 56, Dec. 1949, p. 803-806.

Theory of the stress-corrosion, and engineering considerations in its prevention. A portion of the 24th A.S.M. Edward deMille Campbell Memorial Lecture.

For additional annotations indexed in other sections, see:
3B-281; 3C-256-265; 7A-214; 8-308; 14C-103; 23C-79; 23D-133

7A—General

7A-192. How Alloy Iron Ring Lands Are Bonded to Aluminum Pistons. Charles R. Coffey. *Automotive Industries*, v. 101, Nov. 15, 1949, p. 30, 88, 90.

In some cases, for instance, high-performance, two-stroke diesels, top-ring groove wear in light-alloy pistons is a major problem. Use of the "Al-Fin" process by United Engine and Machine Co. In this process, Al is cast about a ferrous metal part which has been tinned with a coating of ferro-aluminum alloy so that the Al fuses with the alloy to present a continuous metal phase between the dissimilar metals.

7A-193. Maroon Crackle Finish on Motorola Portable Radios. W. E. Smith. *Industrial Finishing*, v. 26, Nov. 1949, p. 24-26, 29-30.

Operations include two-stage metal cleaning; electrostatic spraying of primer; hand spraying a coat of crackle lacquer; air drying; top coat of maroon-colored enamel; oven bake; pen marking the dials, and finishing them with gold-tinted lacquer.

7A-194. How We Finish Compacts. A. A. Oertel. *Industrial Finishing*, v. 26, Nov. 1949, p. 36-38, 40, 42, 44.

How ladies' compacts are automatically buffed; cleaned in solvents, dipped in clear lacquer, and baked in a controlled electric oven.

7A-195. Cleaning-Painting Setup for Metal Toys. F. C. Tanessferro. *Industrial Finishing*, v. 26, Nov. 1949, p. 50, 52.

Completely conveyorized set-up that includes two-stage cleaning, dip coating in colors, and infrared oven drying, with transferring at two stations.

7A-196. Tin Coatings in the Wire Industry. Frederick A. Lowenheim and Herbert E. Hirschland. *Wire and Wire*

Products, v. 24, Nov. 1949, p. 1028-1032, 1068-1069.

Various methods for applying tin coatings, including aqueous immersion, electroplating, and fused-salt tinning. Bath compositions. Deals with both steel and copper wire.

7A-197. Complete Finishing System at Morton Manufacturing Company. *Industrial Heating*, v. 16, Nov. 1949, p. 2017-2020, 2022, 2024, 2026, 2028, 2082, 2084, 2086.

Equipment for cleaning, enamel painting, and drying applied to miscellaneous metal railway-car and kitchen equipment.

7A-198. Du Pont Research at Last Finds a Way to Line Tanks With Teflon. E. C. Fetter. *Chemical Engineering*, v. 56, Nov. 1949, p. 120-124.

Sprayed plastic lining which resists practically all chemicals up to 500° F. and which is competitive with glass and rubber linings. Presented in the form of questions of the author and answers obtained during a number of meetings and telephone conversations with Du Pont representatives.

7A-199. The Vapor-Phase Deposition of Refractory Materials. I. General Conditions and Apparatus. I. E. Campbell, C. F. Powell, D. H. Nowicki, and B. W. Gonser. *Journal of the Electrochemical Society*, v. 96, Nov. 1949, p. 318-333.

See abstract of condensed version in *Iron Age*, item 7A-89, 1949.

7A-200. Chemical Polishing of Metal Products. Russell L. Deubner. *Finish*, v. 6, Dec. 1949, p. 19-20.

New process developed at Battelle Memorial Institute by which metal products can be given a bright, reflective surface without mechanical or electrical operations. The product is merely dipped into a chemical solution. When withdrawn a few minutes later, it is polished to a smooth, highly reflective luster. Major advantages are simplicity and nonetching character of the solution. Metals to which the process is applicable include brass, copper, nickel silver, monel, nickel, and aluminum.

7A-201. Spraying Technique for Porcelain Enamels and Synthetic Finishes. M. L. Pouilly. *Finish*, v. 6, Dec. 1949, p. 31-32, 70, 72.

"Low-pressure" spraying for porcelain enamels and pointers on control of spraying technique for synthetic finishes.

7A-202. Adherence of Glass to Metal. Joseph A. Pask. *Finish*, v. 6, Dec. 1949, p. 41, 68-69.

Previously abstracted from *Better Enameling*. See item 7A-184, 1949.

7A-203. How To Apply Metal Coatings by Vacuum Evaporation. *Steel*, v. 125, Dec. 12, 1949, p. 84-87, 115-116.

Commercial procedures, equipment, and applications of relatively new technique.

7A-204. Metal Polish Formulations. Cornelia T. Snell. *Chemical Industries*, v. 65, Nov. 1949, p. 742, 744, 746.

History, production, and metallic and nonmetallic uses. 14 ref.

7A-205. Porcelain Enamel Process Defects: Causes and Possible Cures. Part XII. M. E. McHardy. *Ceramic Industry*, v. 53, Dec. 1949, p. 62-63.

Low acid resistance of ordinary enamels; defects of titanium enamels. Low acid resistance, black specks, tearing, color variation, lumps, and rough surface.

7A-206. Metal Spraying Costs. L. E. Kunkler. *Welding Engineer*, v. 34, Dec. 1949, p. 28-29.

Tables help to calculate operating costs, speeds, thickness per lb. of sprayed metal, and amount of metal required to spray a cylindrical surface of given diameter.

7A-207. Die Entwicklung der Metallspritztechnik seit dem Jahre 1938. (Development of Metal Spraying Technique Since 1938.) K. Krekeler. *Schweissen und Schneiden*, v. 1, Sept. 1949, p. 153-158.

64 references.

7A-208. The Mechanism of the Protective Action of an Unpigmented Film of Polystyrene. J. E. O. Mayne. *Journal of the Oil & Colour Chemists' Association*, v. 32, Oct. 1949, p. 481-487.

The diffusion of water, oxygen, and chloride ions through the above film to the steel base was studied in order to determine mechanism of corrosion prevention. 10 ref.

7A-209. Blistering of Paint Films on Metal Under Sub-Marine Conditions. P. J. Gay. *Journal of the Oil & Colour Chemists' Association*, v. 32, Oct. 1949, p. 488-498.

Mechanism and character were studied experimentally. Composition of fluid in blisters in paint films on steel; behavior of paint and varnish films on steel and glass during immersion in liquids of different types; and relation between corrosion of painted steel and film blistering. Observations were made on panels immersed in the sea and under accelerated laboratory conditions.

7A-210. Polishing Metals Prior to Finishing. Edward Engel. *Tool Engineer*, v. 23, Dec. 1949, p. 38-40.

Recommended procedures. Methods and apparatus for measurement of surface smoothness. Terms used in surface-finishing work. Merits of different abrasives for different jobs.

7A-211. Trouble Shootin'. John L. McLaughlin. *Better Enameling*, v. 20, Dec. 1949, p. 16-17.

Defects in porcelain enamel known as lumps, boiling, and reboiling. Causes and remedies.

7A-212. Sprayed "Envelopes" Protect Aircraft Skins. *Aero Digest*, v. 59, Dec. 1949, p. 38-39.

Use of sprayed plastic coatings for protection during secondary working operations such as forming, bending, dimpling, and riveting. The coating is stripped after completion of assembly.

7A-213. Battelle Research Aids the Finishing Industry. R. O. Stith. *Products Finishing*, v. 14, Dec. 1949, p. 52-57.

Varied facilities of Battelle Memorial Institute for research in metallic and nonmetallic coatings and their application.

7A-214. Naval Engineering Duty in Peacetime. Richard Doughton, Jr. *Metal Progress*, v. 56, Dec. 1949, p. 829-832.

Some of the engineering work in connection with maintenance of inactive Naval vessels, especially prevention of corrosion and other deterioration.

7A-215. Friden Adopts Electro-Sprayed Wrinkle Finish. F. B. Shear. *Iron Age*, v. 164, Dec. 15, 1949, p. 83-85.

A 300% increase in output, a decrease in rejects, and more good parts per gallon of paint. Procedure and layout.

7A-216. Spraying Paint With Steam. *Iron Age*, v. 164, Dec. 15, 1949, p. 95.

Process using superheated steam instead of compressed air, said to offer several advantages over conventional paint-spraying methods.

7A-217. Production of Composite Materials by Electric Fusion Process. R. K. Hopkins. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 75-88; discussion, p. 88-90.

Previously abstracted from *Industrial Heating*, item 7A-132, 1949.

7B—Ferrous

7B-233. Wrinkle Finish for Ingersoll Steel Furnaces. Adrian Heystek. *Industrial Finishing*, v. 26, Nov. 1949, p. 18-20, 22.

Application procedures and equipment.

7B-234. Continuous Strand Cleaning and Coating of High Carbon Rods and Wire. David L. Doty. *Wire and Wire Products*, v. 24, Nov. 1949, p. 1034-1038, 1065-1067.

Potential advantages and commercial status of continuous strand cleaning and coating of rods and wire in tandem with the patenting operation. The process is largely in the experimental stages and results obtained to date are not considered conclusive.

7B-235. Dip Finishing Component Parts. *Organic Finishing*, v. 10, Nov. 1949, p. 14-16.

Procedures and equipment for finishing bicycle frames and fenders.

7B-236. Continuous Pickling; Descaling Steel Strip for Hot-Rolled Coils. John H. Mort. *Iron and Steel*, v. 22, Nov. 1949, p. 479-485.

Procedures and equipment, including calculations, bath compositions, acid consumption, etc. Calculations are facilitated by nomographs and clarified by numerical examples.

7B-237. Furnace Atmospheres in Vitreous Enamelling. S. E. A. Ryder and G. W. Culshaw. *Foundry Trade Journal*, v. 87, Nov. 3, 1949, p. 551-555; discussion, p. 555-556; *Sheet Metal Industries*, v. 26, Nov. 1949, p. 2401-2404, 2406.

Effects of SO_2 and SO_3 in various concentrations and ratios on quality of enamels made from an acid resisting Ti frit, a high-opacity Zr frit, and an Sb frit.

7B-238. How Pontiac Prefinishes Bumper Bars. *Automotive Industries*, v. 101, Nov. 15, 1949, p. 38-39.

Microfinishing operation.

7B-239. Palm Oil Substitutes for Hot Dip Tinning. W. R. Johnson, L. C. Kinney, and John M. Parks. *Yearbook of the American Iron and Steel Institute*, 1949, p. 495-514; discussion, p. 515-526.

Previously abstracted from preprint. See item 7B-95, 1949.

7B-240. A Study of Paints for Enclosed Structural Members in Steel Housing Construction. H. A. Pray and R. S. Peoples. *Yearbook of the American Iron and Steel Institute*, 1949, p. 527-572; discussion, p. 572-577.

Previously abstracted from preprint. See item 7B-110, 1949.

7B-241. The Behavior of Bituminous Pipe Coatings Under Bending Vibrational Stress. W. Beck. *Corrosion*, v. 5, Dec. 1949, p. 405-408.

Reinforced and nonreinforced asphalt coatings and a wrapping impregnated with petroleum grease were applied to the surface of a steel pipe and exposed to the influence of bending vibrational stresses. With the exception of the grease bandage, all layer systems, when submitted to simultaneous action of low temperature and oscillation, showed brittle fracture and fatigue. Crack formation was followed by measurements of electric resistance and corrosion observations. Results indicate the possibility that low temperatures and vibration from heavy traffic will adversely affect the life of certain bituminous coatings on underground pipe lines.

7B-242. Power Driven Brushes Remove Mill Scale From Steel Shapes. *Steel*, v. 125, Dec. 5, 1949, p. 121.

7B-243. Descaling Wire; New Process Described. *Wire Industry*, v. 16, Nov. 1949, p. 905-906.

New proprietary process, using a chemical solution known as "Jenolite". It is used for both rust removal and rustproofing.

7B-244. Pickling Sheet Steel Prior to Finish Application. T. F. O'Brien. *Finish*, v. 6, Dec. 1949, p. 39-40, 64-65.

General procedures, types of pickling acids, mechanism of pickling, recommended pickling compositions, and smooth vs. etched metal surfaces.

7B-245. The Engineering Implications and Economics of Surface Preparation of Mild Steel Prior to Fabrication. W. A. Johnson. *Engineer*, v. 188, Nov. 18, 1949, p. 589-591. A condensation.

Various methods of surface preparation and prevention of corrosion by means of coatings. Advantages of sprayed aluminum.

7B-246. Cleaning Ferrous Metal Parts. R. Mansell. *Machinery* (London), v. 75, Nov. 17, 1949, p. 717-718.

Use of solvent cleaners, steam-cleaning equipment, phosphoric-acid cleaners for rust removal, and vapor degreasing and alkaline cleaning.

7B-247. Durch die Formgebung der Rohware bedingte Emailfehler. (Enameling Defects Due to Forming of the Metal Prior to Enameling.) Hans J. Karmaus. *Metalloberfläche*, v. 3, Oct. 1949, p. A186-A191.

Causes and preventive measures.

7B-248. Der heutige Stand des Beizens und des Feuerverzinkens. (The Present Status of Pickling and Hot-Galvanizing.) Rolf Haarmann. *Stahl und Eisen*, v. 69, Oct. 13, 1949, p. 734-739.

Reviews literature and shows that, in the Fe-Zn reaction, several factors need be considered. Even small amounts of Al retard this reaction. Small amounts of Cu in the Zn bath have no appreciable effect; but Cd is an undesirable element. The importance of C and Si content in the steel is emphasized, also the effect of surface treatment on the adhesiveness of the zinc plating. 48 ref.

7B-249. Pickling Sheet Steel Prior to Porcelain Enameling. T. F. O'Brien. *Better Enameling*, v. 20, Dec. 1949, p. 6-7, 18-19, 34.

General discussion and practical recommendations.

7B-250. Linings for Steel Shipping Containers. L. F. McKay. *Chemical and Engineering News*, v. 27, Dec. 12, 1949, p. 3694-3697.

Research program sponsored by Steel Shipping Container Institute at Battelle Memorial Institute. Effect of surface conditions on coatings performance was investigated by automatically spraying measured thicknesses of representative and widely used commercial coatings onto the various surfaces and then placing the coatings in contact with corrosive chemicals in test coils.

7C—Nonferrous

7C-41. An Electrolytic Wire Cleaner. C. B. Leape. *Organic Finishing*, v. 10, Nov. 1949, p. 12-13.

Equipment developed at Westinghouse to clean copper wire prior to enameling.

7C-42. Pickling of Nickel and High-Nickel Alloys. *Metal Treatment and Drop Forging*, v. 16, Autumn 1949, p. 183-188.

Composition of solutions suitable for pickling various high-Ni alloys. Cleaning and degreasing treatments, and various dip and paste pickle solutions for removal of tarnishes, thick scales, and thin oxide films associated with different alloys. Importance of the absence of iron; methods for its detection and removal.

7C-43. Finishing Zinc and Zinc Base Alloys. Jerome L. Bleiweis. *American Machinist*, v. 93, Dec. 15, 1949, p. 129.

The Cronak process for increasing corrosion resistance and the "Ebonol Z" process for production of a jet black finish.

7C-44. Versatile Finishing Line for Furniture Hardware. *Die Castings*, v. 7, Dec. 1949, p. 42-44.

Cleaning and plating line for Zn-base die castings.

7C-45. Décapage du laiton avant nickelage. (Pickling of Brass Before Nickel-Plating.) Pierre Tyvaert. *Fonderie*, Sept. 1949, p. 1744.

A new method. The chemical composition of the pickling agent and the technique of pickling.

7D—Light Metals

7D-64. Vitreous Enameling Broadens Scope of Aluminum Applications. N. Bruce Bagger. *Materials & Methods*, v. 30, Nov. 1949, p. 55-56.

New low-temperature porcelain coating for Al alloys, which has excellent service properties and is available in many colors.

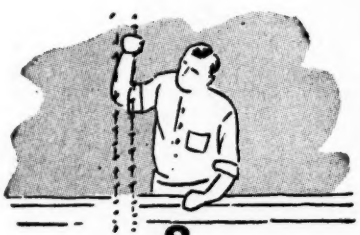
7D-65. Some Experiments on the Painting of Aluminium Alloys. W. A. Edwards. *Light Metals*, v. 12, Nov. 1949, p. 626-632.

Effect of type of paint and of type of alloy; intrinsic corrosion resistance of various Al alloys; effect of alloy variation on coating performance; performance of different finishes, and finishes for marine conditions.

7D-66. Pretreatment of Aluminum Sheet for Painting. G. W. Birdsall. *Metal Progress*, v. 56, Dec. 1949, p. 825-828.

In processing the sheet, an extremely thin layer of the base metal is dissolved to form the aluminum phosphates and other compounds that make up the coating.

For additional annotations indexed in other sections, see:
6D-35-37; **8**-313-316; **15**-79-80; **19D**-68; **22A**-279; **22C**-34; **23A**-45; **24A**-170



8
ELECTRODEPOSITION and ELECTROFINISHING

8-305. (Book) **The Principles of Electrodeposition. Ed. 2.** Samuel Field. 340 pages. 1949. Sir Isaac Pitman and Sons, Ltd., 39 Parker St., Kingsway, London, W. C. 2, England.

Qualitative and quantitative electrolysis, properties of gases and solutions, electrolytic conductance, thermochemistry, electrode potentials, accumulators, hydrogen-ion concentration, electrode reactions, throwing power, separation and codeposition of metals, addition agents in electrodeposition, strong electrolytes, and bipolar electrodes.

8-306. Improved Plating and Corrosion Protection to Result From New Developments Revealed at Electrochemical Society Meetings. *Steel*, v. 125, Nov. 21, 1949, p. 82-85, 117-118, 120.

Extended abstracts of a number of papers presented at 96th annual meeting. X-ray method for determining thickness of tin coating on steel; recent advances in tin, chromium, and alloy plating; and various corrosion processes.

8-307. The Physical and Engineering Properties of Electrodeposited Metals. J. S. Anderson. *Electroplating and Metal Finishing*, v. 3, Nov. 1949, p. 84-91.

Engineering applications of electrodeposits: decorative surfaces; protection of base metals from corrosion; plating for increased surface hardness and for reclamation; stress in electrodeposits; hydrogen embrittlement; improved bearing properties; modified electrical and thermal properties; improved luster and reflectivity; alloy plating. 18 ref.

8-308. Electroplated Coatings for Corrosion Protection. A. G. Sussex. *Electroplating and Metal Finishing*, v. 3, Nov. 1949, p. 97-99, 102.

Corrosion promoting and controlling factors, corrosion of electroplated metal components, corrosion protection by typical electroplated coatings, and role of alloy plating in protection. 32 ref.

8-309. The Proper Application of Electrolytic Polishing to Metal Finishing. C. E. Gardam. *Metal Treatment and Drop Forging*, v. 16, Autumn 1949, p. 146-148.

Compares mechanical and electropolishing—advantages and disadvantages of the two processes. Prospects of electropolishing for the future.

8-310. Sur les dangers d'explosion des bains acétoperchloriques de polissage électrolytique. (Concerning Explosion Hazards of Acetic-Perchloric Baths Used in Electropolishing.) L. Médard, P. A. Jacquet, and R. Sartorius. *Revue de Métallurgie*, v. 46, Aug. 1949, p. 549-560.

A diagram of the ternary system of perchloric acid, acetic anhydride, and water clearly indicates the explosive, inflammable, and safe areas.

8-311. Verkupferung aus dem Pyrophosphatbad. (Copper Plating From the Pyrophosphate Bath.) *Metalloberfläche*, v. 1, sec. 3, Sept. 1949, p. B91.

A patented method. Data on suitable bath compositions.

8-312. Kann man das Cyankalium in galvanischen Bädern durch Cyannatrium ersetzen? (Can Potassium Cyanide in Galvanic Baths by Replaced by Sodium Cyanide?) *Metalloberfläche*, v. 1, sec. B, Sept. 1949, p. B92.

With the exception of gold baths with soluble gold anodes, both theory and practice permit use of NaCN in place of KCN in galvanic baths without any undesirable effects.

8-313. Production-Line Plating Aluminum. *Steel*, v. 125, Dec. 5, 1949, p. 94-97, 116, 118, 121.

Equipment and procedures. Cleaning and conditioning solutions. Bath compositions.

8-314. Electrodeposited Coatings for Atmospheric Corrosion Protection. Fielding Ogburn. *Product Engineering*, v. 20, Dec. 1949, p. 135-139.

Products made of steel or Zn-base die castings are effectively protected against atmospheric corrosion by electroplated coatings of Zn, Cd, Ni, Cr, Cu, and several other metals. Length and quality of protection depend on type of atmospheric corrosion, coating and base metal.

8-315. Electrolytic Tinplate; Its Production and Benefits. Samuel S. Johnston. *Plating*, v. 36, Dec. 1949, p. 1233-1235.

10 references.

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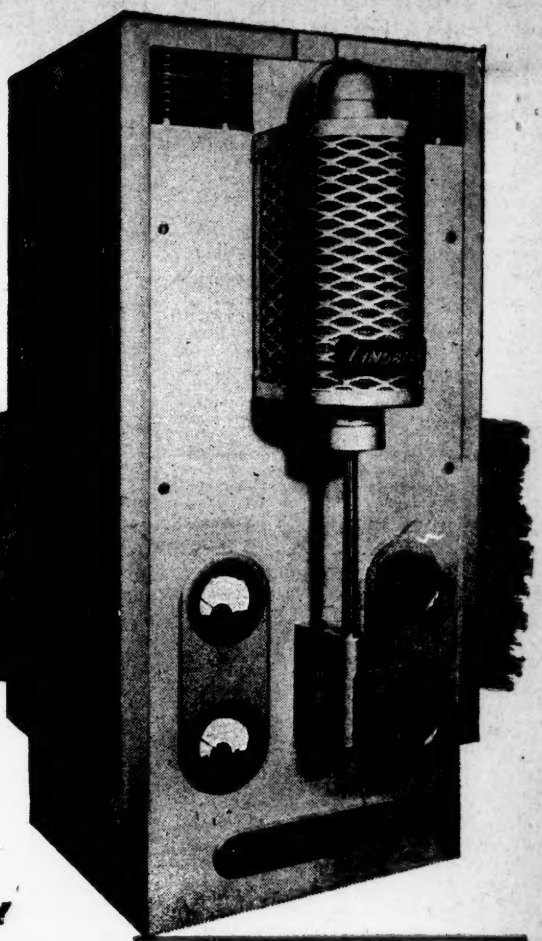

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8-316. Airplane Propeller Production. *Plating*, v. 36, Dec. 1949, p. 1228-1232.

Surface preparation, plating, and other finishing procedures.

8-317. The Strength and Ductility of Electrodeposited Metals. I. The Hydraulic Bulge Test. Thomas A. Prater and Harold J. Read. *Plating*, v. 36, Dec. 1949, p. 1221-1226.

Test method and apparatus; interpretation of results. (To be continued.)

8-318. Trouble Shooting in the Plating Room. Richard B. Saltonstall. *Plating*, v. 36, Dec. 1949, p. 1216-1220.

Difficulties in new installations: poor adhesion, pitting, roughness, streaks and blotchy areas, poor corrosion resistance, and their causes and remedies.

8-319. Plating Impurities Removed Automatically. *Steel*, v. 125, Dec. 12, 1949, p. 118.

Self-cleaning filter system for complete removal of solid impurities in continuous or intermittent operation developed for permanent installation in electroplating and other processing setups.

8-320. Cathodic Passivation and Structures of Electrolytic Precipitates in Solutions of Simple and Complex Salts. (In Russian.) A. T. Vagramyan and Z. A. Solov'eva. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 11, 1949, p. 321-324.

Polarization curves obtained from precipitation of Ag from $AgNO_3$ under different conditions. The purpose of the investigation was to determine conditions for production of fine-grained precipitates from simple salts.

8-321. Causes of Blistering of Electrodeposits on Zinc Alloy Die Castings. S. Wernick, H. H. Symonds, and H. C. Castell. *Journal of Electrodepositors' Technical Society*, v. 24, 1949, p. 195-210. (Preprint.)

Characteristics of service and process blisters. Main causes and some preventive measures. 16 ref.

8-322. Automatic Plating Plant Design. A. Smart. *Metal Industry*, v. 75, Nov. 18, 1949, p. 433-435; Dec. 2, 1949, p. 476-478.

8-323. Potassium Stannate for Tin Plating. F. A. Lowenheim. *Wire and Wire Products*, v. 24, Dec. 1949, p. 1117-1120.

Use of potassium stannate in place of sodium stannate permits attainment of much higher plating speeds while retaining all the advantages of the alkaline stannate solution. General characteristics of the solution and suggestions for its use. 11 ref.

8-324. Uniform Electrolytic Tin Plate Coats Assured by New Plating Thickness Meter. *Steel*, v. 125, Dec. 19, 1949, p. 108.

New instrument which continuously indicates and records tin coating thickness on steel strip during the plating operation.

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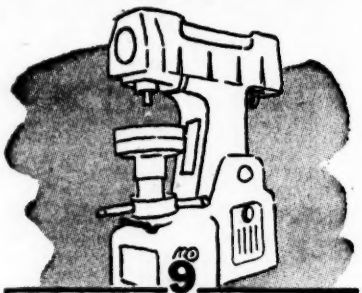
For additional annotations indexed in other sections, see:
3A-253; 3B-260; 7A-196-213; 7C-44; 10C-189; 11-389; 15-79; 22A-279; 24D-26



PHYSICAL and MECHANICAL TESTING

9-318. Dynamic Strain-Gaging of Seamless Steel. *Iron Age*, v. 164, Nov. 17, 1949, p. 85.

Use to determine instantaneous loads while seamless steel tubing was being rolled in the high-mill after piercing. In another instance, strains and stresses occurring during assembly of a drill-pipe joint and while it was being tested were determined. Similar data were obtained for a threaded bell-joint casing while the joint was pulled in tension to destruction.

9-319. "Transition" Temperatures Under Various Amounts of Plastic Flow. N. Grossman and C. W. MacGregor. *Welding Journal*, v. 28, Nov. 1949, p. 551s-555s.

Four hot-rolled, low-carbon steel plates were used to study the relationship between angle of bend and permanent deflection preceding the fracture of notched-bar specimens. The tests were conducted isothermally at constant deflection rate. Results indicated that transition temperatures are functions of geometries as well as of materials; and that at a permanent angular bend of ½° the testing temperature at fracture for the notch geometries investigated was about 100° F. above the respective brittle transition temperatures used in the M.I.T. test.

9-320. Speed of Loading in Tensile Testing of Cast Iron. *Foundry Trade Journal*, v. 87, Nov. 10, 1949, p. 573-574. Translated and condensed from paper by M. Gelain.

Effects of loading speeds on tensile strengths of high-strength cast iron.

9-321. The Measurement of Changes in Length With the Aid of Strain Gauges. A. L. Biermasz and H. Hoekstra. *Philips Technical Review*, v. 11, July 1949, p. 23-31.

Apparatus, principles, techniques, and applications.

9-322. Considérations d'ensemble sur le problème de la décohésion. (General Discussion of the Problem of Failure.) W. Soete. *La Metallurgia Italiana*, v. 41, July-Aug. 1949, p. 175-180.

The problem of brittle fracture and criteria for choice of test methods. A static bending test on a notched bar is proposed. Factors which affect various phases of the test—crack formation and its propagation—and criteria for evaluation of the results are studied.

9-323. Installation of Strain Gages on Pressure Vessels. *Product Engineering*, v. 20, Dec. 1949, p. 143-144. Condensed from "Application of Electrical Resistance Strain-Gages", by A. L. Tannahill.

Previously abstracted from *Engineer*. See item 9-188, 1949.

9-324. Biaxial Tension-Tension Fatigue Strengths of Metals. Joseph Marin. *Journal of Applied Mechanics*, v. 16 (*Transactions of the American Society of Mechanical Engineers*, v. 71), Dec. 1949, p. 383-388.

See abstract from *Proceedings of the Society for Experimental Stress Analysis*, item 9-300, 1949.

9-325. An Automatic Recording Apparatus for the Study of Flow and Recovery in Metals. E. N. Da C. Andrade and A. J. Kennedy. *Proceedings of the Physical Society*, v. 62, sec. B, Nov. 1, 1949, p. 669-675.

Apparatus which records continuously on photographic paper the extension-vs.-time curve of a metal wire under stress. Deformation of the paper during development and drying does not affect accuracy. The apparatus also automatically removes and restores the load, repeatedly if desired, at predetermined times.

9-326. An Investigation of the Mechanical Properties of Materials at Very High Rates of Loading. H. Kolsky. *Proceedings of the Physical Society*, v. 62, sec. B, Nov. 1, 1949, p. 676-700.

Method of determining the stress-strain relation of materials when stresses are applied for times of the order of 20 microsec. The apparatus is a modification of the Hopkinson pressure bar, and detonators are used to produce large transient stresses. Thin specimens of rubbers, plastics, and metals were investigated. The phenomenon of delayed recovery is discussed in terms of the theory of mechanical relaxation and memory effects in the material.

9-327. Micro-Hardness Testing; Design and Construction of a Simple Instrument. H. A. Unckel. *Metal Industry*, v. 75, Nov. 18, 1949, p. 431-432.

The majority of microhardness testers are relatively complicated and applicable only to the inverted type of microscope. The instrument described can be used with both the inverted and the ordinary table-type microscope.

9-328. Tests of an Aluminum Alloy Gasoline Transport Semi-Trailer. J. H. Dunn and R. L. Moore. *Automotive Industries*, v. 101, Dec. 1, 1949, p. 35, 72.

Results of static-load tests using strain gages.

9-329. A 1000-Ton Horizontal Structure-Testing Machine. *Engineer*, v. 188, Nov. 18, 1949, p. 576-579.

Machine intended for research on the strength of structural components of aircraft.

9-330. Strain Measurement by X-Ray Diffraction Methods. G. B. Greenough. *Aeronautical Quarterly*, v. 1, Nov. 1949, p. 211-224.

Principles of the method. Types of stress and strain systems existing in polycrystalline metals are considered, particular attention being paid to the effect of elastic and plastic anisotropy of individual crystals. Possible modifications of earlier methods of interpreting the measurements. 16 ref.

9-331. Nouvelle méthode dynamique pour la mesure des constantes d'élasticité. (A New Dynamic Method for Measurement of Elastic Constants.) R. Cabarat. *Revue de Métallurgie*, v. 46, Sept. 1949, p. 617-621.

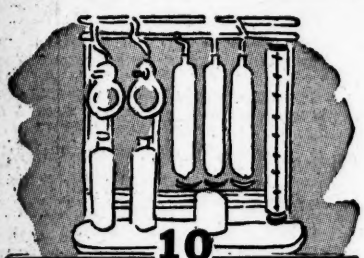
Method is characterized by high precision and by the fact that vibrations are produced and their amplitude measured by means applicable to any solid substance in a wide temperature range (at least up to 800 °C.)

9-332. Application of Centrifugal Force to Investigation of the Mechanical

Strength of Metallic Systems. (In Russian.) I. I. Kornilov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, Aug. 11, 1949, p. 843-846.
Proposes a new method for tensile and bending tests, based on the application of centrifugal force, for use at temperatures up to 900 °C.

9-333. Mechanical Testing at High Temperatures. H. E. Gresham. *Metal Industry*, v. 75, Dec. 2, 1949, p. 471-474.
Methods and equipment.

For additional annotations indexed in other sections, see: 3A-248; 3C-253-268-270; 3D-83; 8-317; 19A-275-290; 22B-446; 24D-30



10A—General

10A-153. Beryllium; Determination in Presence of Much Fe, Al and Mg. A. Leibowitz and R. S. Young. *Iron and Steel*, v. 22, Nov. 1949, p. 486.
Gravimetric procedure.

10A-154. The Role of Organic Reagents in the Chemistry of Specific, Selective, and Sensitive Reactions. Fritz Feigl. *Analytical Chemistry*, v. 21, Nov. 1949, p. 1298-1313.
Correlated review of the literature. 108 ref.

10A-155. Polysubstituted 1,10-Phenanthrolines and Bipyridines as Multiple Range Redox Indicators; Further Applications as Specific Organic Analytical Reagents. Warren W. Brandt and G. Frederick Smith. *Analytical Chemistry*, v. 21, Nov. 1949, p. 1313-1319.
Use in the photometric determination of Fe, Cu, Mo, and Co, and detection of other metals; and as masking reagents.

10A-156. Organic Reagents in Inorganic Analysis; Sources of Error and Interferences. Philip W. West. *Analytical Chemistry*, v. 21, Nov. 1949, p. 1342-1344.
A general survey. 10 ref.

10A-157. Photometric Determination of Sulfur in Metals and Alloys. C. L. Luke. *Analytical Chemistry*, v. 21, Nov. 1949, p. 1369-1373.
Procedure consists of solution of the sample in a mixture of HCl and HNO_3, destruction of the HNO_3, reduction of sulfate to sulfide with the aid of HI, distillation of H_2S into a solution of NH_4OH, and finally precipitation as colloidal PbS, and measurement of transmittancy of the sulfide sol at 370 $m\mu$.

10A-158. Recording Device Streamlines Analyzing of Molten Metal. *American Foundryman*, v. 16, Dec. 1949, p. 57.
Rapid spectrographic technique.

10A-159. (Book) **Methods of Quantitative Micro-Analysis.** R. F. Milton and W. A. Waters, Editors. 599 pages. 1949. Edward Arnold & Co., London.
Gravimetric apparatus; general microchemical techniques; microanalysis of organic compounds; volumetric and colorimetric analysis; and electrochemical and gasometric methods. Footnote references.

10B—Ferrous

10B-101. Le dosage de l'oxygène dans l'acier liquide. Application à l'acier Martin basique. (Determination of Oxygen in Liquid Steel. Application to Basic Openhearth Steel.) M. Lacomble and M. Nepper. *Revue de Métallurgie*, v. 46, Aug. 1949, p. 561-565; discussion, p. 565-566.
An improved Herty method. Advantages, particularly with respect to rapidity, low cost, and accuracy.

10B-102. Molybdenum Separation in Iron Alloys. R. S. Young and A. Leibowitz. *Iron Age*, v. 164, Nov. 24, 1949, p. 75-76.
Various reference sources disagree on the behavior of Mo in the ether-extraction method for separating Fe. Investigation conducted to determine more clearly the proportion of Mo accompanying Fe into the upper ether layer.

10B-103. Steel Analysis Time Cut by Radio Frequency Heating. W. K. Aites. *Steel*, v. 125, Dec. 12, 1949, p. 92-93, 112.
Use of high-frequency induction heating in carbon and sulfur analysis. Temperatures exceeding 3000° F. are used, reducing carbon determination time from 10 to 2½ min.

10B-104. Étude de la répartition des éléments entre les phases l'un alliage. Influence de la cémentite sur les intensités relatives des raies du fer. (Study of the Distribution of Elements Among the Phases of an Alloy. Influence of Cementite on the Relative Intensity of

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Iron Lines.) Henri Triche. *Comptes Rendus* (France), v. 229, Oct. 3, 1949, p. 652-653.

Experimental results of study by means of spectrography may be adversely affected by interaction of the source with one of the constituents. In the case of Fe-C alloys, increase in the intensity of the iron lines is related to the thermal action of the source on the cementite. This phenomenon partially contributes to "fatigue" of the spark.

10B-105. Identification of Carbon Steels by Spark Testing. *Machinery* (London), v. 75, Nov. 17, 1949, p. 716-717. From article by W. Jaenicke and G. H. Saul, *Stahl und Eisen*, v. 68, Aug. 12, 1948, p. 301-303.

Contends that representation of the various forms of spark is not satisfactorily obtained by photography. Recommends hand-drawn "spark pictures" for steels of varying carbon content and for Si steel.

10B-106. Potentiometrische Bestimmung von metallischem Eisen, festen Eisenoxydul, Eisenoxyd und löslichen zwei- und dreiwertigen Eisensalzen nebeneinander. (Potentiometric Determination of Metallic Iron, Solid Ferrous Oxide, Iron Oxide, and a Mixture of Insoluble Bivalent and Trivalent Iron Salts.) Bernhard Neumann and Gottfried Meyer. *Fresenius' Zeitschrift für analytische Chemie*, v. 129, no. 3, 1949, p. 229-232.

Ferric ions are reduced to ferrous ions by dissolving the solid mixture in alkaline, ammoniacal, or thiosulfate solutions and separating the soluble from the insoluble components by filtration.

10B-107. Fast Analysis of Acid Slags. Reflective Spectrophotometry Determines FeO-MnO-Cr. E. C. Zuppann and A. E. Martin. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 150-156; discussion, p. 156.

Previously abstracted from *American Foundryman*, item 10B-32, 1949.

10B-108. Bestimmung von metallischem Eisen neben Eisen-II-Oxyd und Eisen-III-Oxyd. (Determination of Metallic Iron in the Presence of Ferrous and Ferric Oxides.) Hans Ulrich v. Vogel. *Archiv für das Eisenhüttenwesen*, v. 20, Sept.-Oct. 1949, p. 287-292.

Various methods including several more recent methods. The bromine-alcohol method was found to produce satisfactory results, provided the samples contain no more than 6% Mn. 34 ref.

10C—Nonferrous

10C-176. Water-Soluble 1,2-Dioximes as Analytical Reagents. Roger C. Voter and Charles V. Banks. *Analytical Chemistry*, v. 21, Nov. 1949, p. 1320-1323.

Advantage over reagents for Ni and Pd such as dimethylglyoxime, which must be made up in organic solvents, where the danger of contamination of the Ni precipitate with excess reagent is always imminent. 25 ref.

10C-177. Precipitation of Thorium From Homogeneous Solution; Separation From Rare Earths of Monazite Sand With Tetrachlorophthalic Acid. Louis Gordon, C. H. Vanselow, and Hobart H. Willard. *Analytical Chemistry*, v. 21, Nov. 1949, p. 1323-1325.

10C-178. Extraction of Cupferrates. N. Howell Furman, W. B. Mason, and Joseph S. Pekola. *Analytical Chemistry*, v. 21, Nov. 1949, p. 1325-1330.

Extraction of cupferrates by chloroform was found to be an effective procedure for removing Fe, Ti, Mo, V, etc., prior to estimation of other substances. 50 ref.

10C-179. Spectrophotometric Study of Spot Tests. E. H. Winslow and H. A. Liebhafsky. *Analytical Chemistry*, v. 21, Nov. 1949, p. 1338-1342.

The α-benzoin oxime test for copper and the identification of silver by the action of a photographic developer were studied spectrophotometrically in transmittance and reflectance. Results indicate the former type of measurement to be preferable for quantitative evaluation of spot tests.

10C-180. Colorimetric Determination of Boron Using 1,1-Dianthrimide. Gordon H. Ellis, Elizabeth Gates Zook, and Oskar Baudisch. *Analytical Chemistry*, v. 21, Nov. 1949, p. 1345-1348.

Sixty organic compounds were tested qualitatively in concentrated H_2SO_4 for their suitability as either colorimetric or fluorometric reagents for boron. Further qualitative testing led to choice of 1-amino-4-hydroxyanthraquinone as a fluorescent and 1,1'-dianthrimide as a colorimetric reagent.

10C-181. Color Reaction of Beryllium With Alkannin and Naphthazarin; Spectrophotometric Studies. A. L. Underwood and W. F. Neuman. *Analytical Chemistry*, v. 21, Nov. 1949, p. 1348-1352. 14 references.

10C-182. Effect of Constituent Materials Upon Spectrographic Measurement of Seven Impurity Elements. M. C. Bachelder. *Analytical Chemistry*, v. 21, Nov. 1949, p. 1366-1369.

Inorganic powder samples weighing 350 micrograms were burned to completion in a d.c. arc and effects of constituent elements upon spectrographic measurement of Sn, V, Be, Cd, Co, Sb, and Mn were studied.

10C-183. Determination of Zinc Oxide as a Residual of Zinc Powder. E. W. Balis, L. B. Bronk, and H. A. Liebhafsky. *Analytical Chemistry*, v. 21, Nov. 1949, p. 1373-1374.

Simple technique, which may be applicable in other cases. The powder was spread on a copper boat, covered, wrapped tightly in annealed copper foil, and heated in vacuum at 450° C. In this way, the Zn was completely removed and the zinc oxide could be brushed off and weighed.

10C-184. Spectrochemical Determination of Lanthanum in Praseodymium Metal. William M. Spicer and Waldemar T. Ziegler. *Analytical Chemistry*, v. 21, Nov. 1949, p. 1422-1423.

10C-185. Colorimetric Determination of Aluminum in Manganese Bronzes. J. Carroll, I. Geld, and G. Norwitz. *American Foundryman*, v. 16, Nov. 1949, p. 43.

Details of procedure.

10C-186. The Determination of Chromium in Ferro-Chromium. *Journal of the Iron and Steel Institute*, v. 163, Nov. 1949, p. 307-310.

Committee report. Method based on ammonium persulfide oxidation with silver nitrate as catalyst, followed by titration with ferrous ammonium sulfate and standard potassium dichromate, using barium diphenylamine sulfonate as indicator.

10C-187. Direct Determination of Iron in Brass and Bronze. D. Goldberg. *Iron Age*, v. 164, Nov. 17, 1949, p. 95-96.

Colorimetric method which requires considerably less time than conventional chemical analysis and gives greater accuracy because of elimination of iron loss.

10C-188. Use of Complexones in Chemical Analysis. II. (Cerimetric Determination of Cobalt.) (In English.) R. Pribil and V. Malicky. *Collection of Czechoslovak Chemical Communications*, v. 14, no. 7, 1949, p. 413-426.

The properties of complexes of bi- and tri-valent cobalt with ethylenediamine tetra-acetic acid. Both complexes form redox systems of relatively low normal potential, making possible oxidimetric determination of bivalent Co. A method of cerimetric determination was developed applicable even in presence of metals usually accompanying Co. How to eliminate interfering influence of Mn and Ni.

10C-189. Determination of Impurities in Electroplating Solutions. XV. Traces of Silver in Copper Plating Baths. Earl J. Serfass and P. Burkhead. *Plating*, v. 36, Dec. 1949, p. 1237-1239, 1242-1244.

Reviews the literature. Details of method decided upon. 19 ref.

10C-190. Determination of Uranium in Ores by Field Analysis. F. E. Senftle and C. McMahon. *Canadian Mining and Metallurgical Bulletin*, v. 42, Nov. 1949, p. 618-621.

Geiger-counter technique for rough quantitative analysis.

10C-191. Characteristics of Pulsed Arcs in Spectrochemical Analysis. Part I. Zinc Alloys. D. A. Sinclair. *Journal of the Optical Society of America*, v. 39, Nov. 1949, p. 958-966.

Variations of some spectrochemically significant properties of pulsed-arc discharges produced by a condensed-arc-source unit. Quantitative responses of sensitivities, line ratios, and electrode heating to changes in pulse form.

10C-192. Determination of Arsenic in Lead and Tin Alloys. Louis Silverman. *Iron Age*, v. 164, Dec. 15, 1949, p. 96-98.

Rapid colorimetric method which employs sodium hypophosphite as a selective reducing agent for arsenic chloride in strong acid solution.

10C-193. Réaction de fluorescence de la résorcine sans anhydride phtalique. Application à l'identification du zinc et du cadmium. (Fluorescence Reaction of Resorcinol Obtained Without Use of Phthalic Anhydride. Application to Identification of Zinc and Cadmium.) Georges Denigès. *Comptes Rendus* (France), v. 229, Oct. 17, 1949, p. 734-735.

The classical reaction of fluorescence of resorcinol is obtained by condensation with phthalic anhydride. New technique is based on the fact that the action of H_2SO_4 or H_3PO_4 on resorcinol produces marked fluorescence.

10D—Light Metals

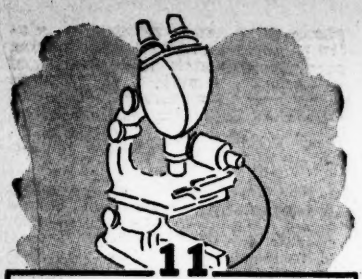
10D-38. Quantitative Study of Reaction Between Beryllium and Quinizarin-2-Sulfonic Acid. Myron W. Cucci, W. F. Neuman, and B. J. Mulryan. *Analytical Chemistry*, v. 21, Nov. 1949, p. 1358-1360.

Previously abstracted from *U. S. Atomic Energy Commission*, AECD-1990. See item 10C-107, 1949.

10D-39. (Book) Modern Methods for the Analysis of Aluminium Alloys. 144 pages. 1949. Chapman and Hall, Ltd., 37 Essex St., London, W.C. 2, England. 13s., 6d.

New methods, modified versions of those already known, and a few standard ones. Methods range from those requiring modern physicochemical instruments, such as the polarograph and photometer, to those which may be carried out with equipment available in the general chemical laboratory. Chapters on gravimetric and volumetric methods, electrolytic methods, and photopolarographic methods. An appendix deals with less common elements and with composite schemes of photometric analysis.

For additional annotations indexed in other sections, see: 2C-104



11

APPARATUS, INSTRUMENTS and METHODS

11-365. Metallography of Beryllium. A. R. Kaufmann, P. Gordon, and D. W. Lillie. *Metal Progress*, v. 56, Nov. 1949, p. 664-665.

A satisfactory etchant has not been found for revealing the microstructure of Be. Therefore, the unetched metal was examined with polarized light. Details of technique.

11-366. Metallography of Indium and Indium-Rich Alloys. S. C. Carapella and E. A. Peretti. *Metal Progress*, v. 56, Nov. 1949, p. 666.

Describes suitable metallographic technique. A typical example is illustrated.

11-367. Metallography of Zirconium and Zirconium Alloys. A. H. Roberson. *Metal Progress*, v. 56, Nov. 1949, p. 667-669.

Specimen preparation techniques and etchant compositions, including electrolytic etchants. Twelve photomicrographs show typical results, as-cast, and after quenching, rolling, etc.

11-368. Cathodic Vacuum Etching of Metals. Don M. McCutcheon and William Pahl. *Metal Progress*, v. 56, Nov. 1949, p. 674-679.

The results obtained, particularly for revealing flow lines, indicate that the method can be recommended for special problems where the extra care and time required are justified. Highly alloyed metals, difficult to etch chemically, are especially recommended for cathodic etching.

11-369. Flow Line Structure of Cartridge Brass. L. A. Carlson. *Metal Progress*, v. 56, Nov. 1949, p. 681-684.

During production of 0.50-caliber brass cartridge cases, cracking of some of the cases at the head rim, as they came from the machine which inserted the primer, was noticed. Conventional metallographic methods gave no clues to the cause of the difficulty, hence a new etching procedure was developed to reveal the flow-line structure.

11-370. Three New Etchants for Nonferrous Metals. Charles T. Flachbarth and Chester S. Pondo. *Metal Progress*, v. 56, Nov. 1949, p. 688-691.

Main purpose of the new etchants is to produce greater contrast in the microstructures of copper and Ni alloys. One of these etchants, called Pondo's reagent, is particularly effective on Cu, alpha brasses, and phosphor bronzes. The second produces good contrast on Ni specimens without the use of an electrolytic bath. It also produces a clear, flat etch with emphasis on the grain boundaries when used on Monel. The other etchant is outstanding for contrast etching of high-Ni alloys, such as Monel or Ni-Span C.

11-371. Ferric Chloride Etchant for Austenite Grain Size of Low-Carbon Steel. O. O. Miller and M. J. Day. *Metal Progress*, v. 56, Nov. 1949, p. 692-695.

Results of a study of about 200 etchants and of austenite grain size of 20 low-carbon steels were used in development of a recommended procedure using 5% ferric chloride. Comparative results for 4 etchants.

11-372. Electropolishing of Steel in Chrome-Acetic Acid Electrolyte. C. E. Morris. *Metal Progress*, v. 56, Nov. 1949, p. 696-699, 710, 712, 714.

A chromic-acetic acid electrolyte of low water content that can be made up without recourse to acetic anhydride. What is believed to be an entirely new method of making electrical contact with the specimens is also described, as well as a somewhat unusual way of agitating the solution during electropolishing. How the procedure is applied to metallographic studies.

11-373. A Direct Method of Determining Preferred Orientation of a Flat Reflection Sample Using a Geiger Counter X-Ray Spectrometer. L. G. Schulz. *Journal of Applied Physics*, v. 20, Nov. 1949, p. 1030-1033.

Chief advantage of the method is that the experimental data may be used directly without corrections for changes in geometry during rotation of the sample.

11-374. Determination of Preferred Orientation in Flat Transmission Samples Using a Geiger Counter X-Ray Spectrometer. L. G. Schulz. *Journal of Applied Physics*, v. 20, Nov. 1949, p. 1033-1036.

Method employing a diverging X-ray beam. Shows that for a certain range of sample thicknesses, counting rate is independent of rotation of the samples.

11-375. Interferometric Study of Slip Bands on Metal Crystals. S. Tolansky and J. Holden. *Nature*, v. 164, Oct. 29, 1949, p. 754-755.

Use of multiple-beam interference methods to study displacements which appear on the surfaces of metal crystals when strained. Principal advantages are: the detailed contours of displacement steps are clearly revealed; exact evaluation of displacements of only a few Angstrom units can be made; owing to a high sensitivity, onset of the slip is shown at a very early stage; and slip with abnormally low loads can be detected. It has been successfully applied to aluminum and tin.

11-376. Preparation of Aluminium Single Crystals With a Definite Orientation. (In English.) T. J. Tiedema. *Acta Crystallographica*, v. 2, Oct. 1949, p. 261-262.

Method for preparation of Al single-crystal wires and plates with any desired orientation, to within 1°.

11-377. Le microscope de phase. (The Phase Microscope.) A. Arnulf. *Revue de Métallurgie*, v. 46, July 1949, p. 457-460; discussion, p. 461-462.

Metallographic uses. Optical arrangements are shown schematically.

11-378. Méthode d'étude des granulations visibles à la surface des métaux soumis à des déformations plastiques. (Method of Study of Visible Irregularities on the Surfaces of Metals Resulting From Plastic Deformation.) J. Hérenguel and M. Scheidecker. *Revue de Métallurgie*, v. 46, Aug. 1949, p. 537-543.

Method consists of study of corrosion patterns and slip lines. Indicates that macroscopic irregularities are related to the microstructure resulting from a series of recrystallizations.

11-379. Cathodic Vacuum Etching of Metals. Don M. McCutcheon and William Pahl. *Steel Processing*, v. 35, Nov. 1949, p. 590-591.

See abstract from *Metal Progress*, item 11-368, 1949.

11-380. An Apparatus for Preparing Small Samples of Pure Iron to Which Fixed Quantities of Impurities Can Be Added. J. D. Fast. *Philips Research Reports*, v. 4, Oct. 1949, p. 370-374.

High-frequency-melting apparatus for preparing alloys of well-defined compositions in quantities up to 2 kg.

11-381. An X-Ray Camera for Obtaining Powder Pictures at High Pressures. A. W. Lawson and N. A. Riley. *Review of Scientific Instruments*, v. 20, Nov. 1949, p. 763-765.

Two methods which have been successfully employed at pressures ranging up to 15,000 atm. In both schemes the sample is enclosed in a small beryllium bomb which serves to retain the pressure but permits the X-rays to be transmitted to the sample and diffracted to an external recording film. Sample data on cerium illustrate possibilities and limitations of the technique.

11-382. An Apparatus for Measurement of Extremely High Internal Friction. T'ing-Sui Ke and Marc Ross. *Review of Scientific Instruments*, v. 20, Nov. 1949, p. 795-799.

Simple torsion apparatus. Results were compared with torsion-pendulum measurements using the free-decay method. This apparatus can be used at a constant given stress amplitude and constant frequency of vibration. The stress amplitude and frequency of vibration can be varied over a wide range. The feature that measurements can be made while the zero point is changing renders the apparatus useful in the study of internal friction of freshly cold worked metals.

11-383. Preparation of Samples of Active Metals. Donald F. Clifton. *Review of Scientific Instruments*, v. 20, Nov. 1949, p. 830-831.

Preparation of oxide-free samples by working under liquid nitrogen.

11-384. Straumanis' Method of Film-Shrinkage Correction Modified for Use Without High Angle Lines. A. J. C. Wilson. *Review of Scientific Instruments*, v. 20, Nov. 1949, p. 831-832.

Improved X-ray diffraction technique.

11-385. The Application of X-Ray Methods to the Determination of Phase Boundaries in Metallurgical Equilibrium Diagrams. E. A. Owen and D. P. Morris. *Journal of the Institute of Metals*, v. 76, Oct. 1949, p. 145-168.

Recent criticisms shown to be unfounded. Certain objections to the microscopical method. In the light of X-ray investigations carried out on solid specimens, it is concluded that the study can best be conducted with material in powder form. 35 ref.

11-386. X-Ray Line Broadening in Metals. W. H. Hall. *Proceedings of the Physical Society*, v. 62, sec. A, Nov. 1, 1949, p. 741-743.

Diverse theoretical interpretations can be reconciled in terms of the hypothesis that both particle-size and stress effects are present simultaneously.

11-387. Interferometric Examination of Hardness Indentations on Tin. S. Tolansky and D. G. Nickols. *Nature*, v. 164, Nov. 12, 1949, p. 840.

Technique for production of the tin surface in which molten tin is poured onto hot plate glass. Removal of the tin from the glass reveals an "optically perfect" surface. Indentations were made with a microhardness indenter. Interferometry reveals an asymmetric pattern, in contrast to the symmetric pattern on steel, and related to the crystal structure of the tin. Slip or twinning lines are apparent.

11-388. Method of Investigation of Dendrite Heterogeneity of Alloys. (In

Russian.) V. M. Tageev. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, Aug. 1, 1949, p. 675-677.

Method for direct determination of the composition of solid and liquid phases in multi-component systems. A perforated specimen is heated to the temperature of appearance of the liquid phase. This phase runs out of the perforations, and is collected and analyzed.

11-389. Electrolytic Polishing and Short-Circuit Etching of Copper and Cuprous Alloys. M. Jaroszewicz-Bortnowski and J. Schoofs. *Engineers' Digest*, v. 10, Nov. 1949, p. 381-383. Translated and condensed from *Revue Universelle des Mines*, ser. 9, v. 5, May 1949, p. 170-174.

Improved metallographic procedure. Typical results.

11-390. A β-Filter Furnace for Elevated Temperature Single-Crystal X-Ray Diffraction. E. G. Steward. *Journal of Scientific Instruments and of Physics in Industry*, v. 26, Nov. 1949, p. 371-372.

An attachment for single-crystal X-ray cameras, enabling photographs to be obtained at elevated temperatures. Heating is accomplished by passing an electric current through a cone of nickel foil (for CuK radiation) which surrounds the specimen. At the same time the cone acts as a β-filter for the diffracted X-rays.

11-391. The Preparation of Beryllium Foil. H. Smith. *Journal of Scientific Instruments and of Physics in Industry*, v. 26, Nov. 1949, p. 378-379.

Improved apparatus and technique. Metal is evaporated in high vacuum and condensed on the cooler walls of a Pyrex tube.

11-392. Notes on the Electrolytic Isolation of Carbides in Steel. Gustaf Wranglen. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 185), p. 919-920.

Theory and literature on thermodynamics, kinetics, and their practical application to the above. 16 ref.

11-393. Carbides in Isothermally Transformed Chromium Steels. Walter Crafts and John L. Lamont. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 185), p. 957-967.

Electrolytic extraction of carbides from quenched and tempered steel and their examination under the electron microscope were applied to isothermally transformed steels. A preliminary survey of the utility of the method indicates that it has promising possibilities for investigating the characteristics of pearlite and bainite. Examination of carbon and chromium steels suggests that pearlite is formed with carbides of lamellar and nonlamellar form and that bainite forms with a structure analogous to, but significantly different from, martensite.

11-394. Binary Chart for Interconversions of Mol, Weight, and Volume Percent. John B. Seabrook. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 185), p. 993-994.

11-395. Metallography of Aluminum Casting Alloys. A. M. Montgomery. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 249-255; discussion, p. 255-256.

Previously abstracted from *American Foundryman*, item 11-145, 1949.

11-396. Metallography of Cast Magnesium Alloys. P. F. George. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 133-148; discussion, p. 148-149.

Previously abstracted from preprint. See item 11-141, 1949.

11-397. A New Method for Determining Austenitic Grain Size of Cast Steel. E. J. Eckel and S. J. Paprocki. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 392-396; discussion, p. 396-399.

Previously abstracted from preprint. See item 11-140, 1949.

11-398. Sur la détection micrographique de la fragilité de revenu des aciers au carbone faiblement alliés. (Micrographic Detection of Annealing Brittleness in Low-Alloy Carbon Steels.) Pierre A. Jacquet. *Comptes Rendus* (France), v. 229, Oct. 10, 1949, p. 713-715.

Electropolishing method followed by etching with picric acid solution containing surface-active substances for micrographic investigation of grain boundaries of steel made brittle during annealing. Results for two low-alloy steels, differently heat treated, indicate that brittleness is caused by intergranular segregation of carbon. This result was not obtained when the specimens were mechanically polished, because of the surface deformation resulting from the polishing process.

11-399. The Use of Punched Cards in Molecular Structure Determinations. III. Structure-Factor Calculations of X-Ray Crystallography. (In English.) Jerry Donohue and Verner Schomaker. *Acta Crystallographica*, v. 2, Dec. 1949, p. 344-347.

Method using IBM machines.

11-400. An Improved Punched-Card Method for Crystal Structure-Factor Calculations. (In English.) M. D. Grems and J. S. Kasper. *Acta Crystallographica*, v. 2, Dec. 1949, p. 347-351.

Method using IBM machines.

For additional annotations indexed in other sections, see:
2B-319; **3A**-249; **8**-324; **16A**-112

12 INSPECTION and STANDARDIZATION

12-222. Punch and Die Sets. *American Machinist*, v. 93, Nov. 3, 1949, p. 237, 239; Nov. 17, 1949, p. 135.

A proposed American Standard sponsored by ASME in conjunction with SAE, Metal Cutting Tool Institute and National Machine Tool Builders' Association. Nov. 3 issue: Two series of punch and die sets, back-post sets and diagonal-post sets. Nov. 17 issue: Dimensions for guide-post bushings.

12-223. An Apparatus for Detecting Superficial Cracks in Wires. P. Zijlstra. *Philips Technical Review*, v. 11, July 1949, p. 12-15.

Equipment uses high-frequency alternating current.

12-224. Radiography of Welds in Ship Construction. D. S. Beard. *Welding*, v. 17, Nov. 1949, p. 511-517.

12-225. Odd-Sized Holes to Millionths. E. J. Tangerman. *American Machinist*, v. 93, Dec. 1, 1949, p. 77-80.

Laboratory procedure has now been developed to attain a standard within $\pm$ 0.000002 and to transfer dimension to a hole with 0.000008. Diagrams show method of use.

12-226. White Magnetic Fluid for Crack Detection. *Engineer*, v. 188, Nov. 4, 1949, p. 533.

Use of new type of fluid made by ball milling a mixture of approximately equal parts by volume of aluminum and iron oxide prior to dilution with paraffin, or methyl alcohol, according to the type of base. Tests with specimens known to contain cracks show that there is no reduction in sensitivity due to the addition of Al powder. Surface cracks are shown as white lines.

12-227. Integrated Quality Control Makes Possible Large-Scale Production of Precision Bearings. Walter F. Toerge. *Steel*, v. 125, Dec. 5, 1949, p. 98-102, 104.

Coordination of inspection and machine-shop procedure in production and assembly of ball bearings.

12-228. Light Rays Can Be Tools. A. P. Fultz. *Tool & Die Journal*, v. 15, Oct. 1949, p. 64, 66, 68, 70-71; also *Instruments*, v. 22, Nov. 1949, p. 1050-1054. (Allen R. Fultz.)

Various uses of optics for gaging in the shop or plant.

12-229. Non-Destructive Testing of Metals Eliminates Costly Rejects. Rebecca H. Smith. *Western Metals*, v. 7, Nov. 1949, p. 32-34.

Surveys applications.

12-230. Steel Products Manual. Sec. 7. Alloy Steel Plates. *American Iron and Steel Institute*, Oct. 1949, 66 pages.

Metallurgical aspects, manufacturing practices, quality requirements, chemical requirements, and handling methods. Includes standard practice tables.

12-231. Technological Precision and Fineness of Machining. (In Russian.) A. A. Matalin. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, July 1949, p. 19-22.

Analyzes surface-finish standards used by the Bureau of Standards and the U.S.S.R. Classification according to this standard and its relation to different types of material and methods of machining.

12-232. Checking Castings: Special-Purpose Fixtures; Examples of Design and Application by the de Havilland Engine Co., Ltd. *Aircraft Production*, v. 11, Dec. 1949, p. 413-420.

A system of checking castings for dimensional accuracy before machining. The workpieces remain in the fixtures for preliminary location-drilling, thereby eliminating a considerable proportion of setting-up time. Example shows that the system is adaptable to castings of widely differing forms as well as sizes.

12-233. Accurate Method of Measuring Dovetails. L. F. Wilharm. *Machinery* (American), v. 56, Dec. 1949, p. 178-179, 237.

A method of measuring dovetails based on the sine-bar principle of measuring angles. Data sheets facilitate use of the tool.

12-234. Efficient Gear Inspection in a Gear Job Shop Cuts Rejects, Increases Quality. *Machine and Tool Blue Book*, v. 45, Dec. 1949, p. 130-132.

For additional annotations indexed in other sections, see:
14B-140; **19B**-227; **20A**-511-532; **22A**-264; **22B**-449; **25C**-76

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New and improved Classification System starting in February

13 TEMPERATURE MEASUREMENT and CONTROL

13-73. Metallographic Study of Heat Flow in Rocket Motor Walls. M. C. Sanz and H. C. Ibsen. *Metal Progress*, v. 56, Nov. 1949, p. 685-687.

The large and transitory temperature gradients through the walls cannot be determined satisfactorily by thermocouple or thermometric measurements or by use of temper colors or hardness readings. A method was developed based on the fact that part of the rocket wall undergoes the martensite-austenite reaction during firing. Photomicrographs and hardness tests show the location of the boundary between transformed and untransformed zones. From this information, hot-wall temperatures may be approximated, by the method described, which was applied to a motor with walls of normalized SAE X4130 steel.

13-74. Controlling and Measuring Steel Temperatures in Billet Heating Furnaces. Fred S. Bloom. *Iron and Steel Engineer*, v. 26, Nov. 1949, p. 60-67; discussion, p. 67-70.

Various methods.

13-75. An Absolute Noise Thermometer for High Temperatures and High Pressures. J. B. Garrison and A. W. Lawson. *Review of Scientific Instruments*, v. 20, Nov. 1949, p. 785-794.

A null device for determining the ratio of two absolute temperatures with an accuracy of 0.1% is described. It balances mean-square fluctuations in voltage across the terminals of two resistors arising from thermal agitation at the temperatures to be compared. The ratio of resistances, when noise voltages from the two resistors are equal, determines the ratio of their absolute temperatures.

13-76. Novy presnejsi zpusob mereni licich teplot tavenych kovu. (A New and More Accurate Method for Determination of the Temperature of Molten Metals.) Zdenek Ryska. *Hutnické Listy*, v. 4, Sept. 1949, p. 273-276.

Method and apparatus based on electronic detection and measurement of infra-red radiation. Use of the method for determination of pouring temperatures.

13-77. Pyrometry and Temperature Control. M. W. Johns. *Canadian Metals and Metallurgical Industries*, v. 12, Nov. 1949, p. 20-23, 42-43.

No. 2 of series on fundamentals of metalworking.

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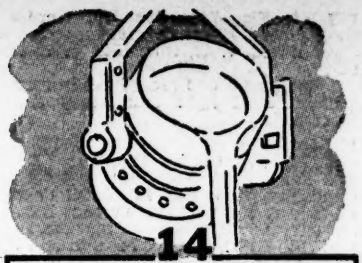


14 FOUNDRY PRACTICE

14A—General

14A-172. New Casting Process Combines Features of Other Forming Methods. T. C. Du Mond. *Materials & Methods*, v. 30, Nov. 1949, p. 52-54.

Increased strength properties, improved finish, and less need for machining are some of the advantages claimed for the production of ferrous and nonferrous parts by the newly developed "Bacco" process. The molten metal is poured into a heated die. Constant pressure is exerted during solidification, followed by an increasing pressure to obtain a forging action. It can be used on aluminum, steel, brass, bronze, copper, etc.

14A-173. Pattern Jigging on Moulding Machines. H. Haynes. *Foundry Trade Journal*, v. 87, Nov. 3, 1949, p. 537-542.

Modern equipment and procedures.

14A-174. Single-Step Process Casts, Forges and Coins Most Metals. *Product Engineering*, v. 20, Dec. 1949, p. 147-148.

New process which casts, forges and coins complicated parts to finished dimensions having tolerances from 0.001 to 0.002 in. The number of operations required after casting is reduced 60-70%; tensile and yield strengths of various metals—steel, aluminum, copper, bronze and brass are increased 10-40%.

14A-175. U. S. Navy Casting Research. H. H. Harris and Erle F. Ross. *Foundry*, v. 77, Nov. 1949, p. 80-81, 166, 168-170, 172; Dec. 1949, p. 86-91, 116, 118.

Experimental production of bladed and shrouded steam-turbine steels cast integrally and jet-engine rotors cast with and without inserted blades. Concluding (Dec.) installment: Specially designed facilities for production of centripetal or counterflow centrifugal castings for steam-turbine and jet-engine use.

14A-176. Pursuing the "Quality Ingredient". Harry B. Swan. *Foundry*, v. 77, Dec. 1949, p. 78, 209, 211.

Factors to be watched and controlled, based on long experience in the foundry industry.

14A-177. Production Aspects of Precision Casting. Alan Whittaker. *Machinery* (London), v. 75, Nov. 17, 1949, p. 709-711.

Advantages and limitations, defects, process layout, and control.

14A-178. Klei als bindmiddel in normzand. (Clay as a Molding-Sand Binder.) M. Stap. *Metalen*, v. 4, Oct. 1949, p. 27-32.

Strength properties of different types of molding sand with varying percentages of moisture contents and with clay as the binder.

14A-179. Algumas Consideraçoes Sobre o Controle de Areias de Fundiçao. (Some Considerations Concerning the Control of Foundry Sands.) Carlos Dias Brosch, Dino Ferraresi, and Heitor Corrêa Gonçalves. *Boletim da Associaçao Brasileira de Metais*, v. 5, July 1949, p. 362-374.

The two most important factors in the control of foundry sand (moisture content and fines) were experimentally investigated. Influence of these factors on the quality of castings.

14A-180. Foundry Cupola Dust Collection. William N. Witheridge. *Heating and Ventilating*, v. 46, Dec. 1949, p. 69-74.

Methods for removal of dust from cupola stack gases and properties of emissions from the ferrous foundry cupola. 27 ref.

14A-181. Modern Practice in Investment Casting. Hiram Brown. *Foundry*, v. 77, Dec. 1949, p. 93, 241-248.

Preparation of investments, readying the mold, gating practice, and melting and pouring. (Second of three articles.)

14A-182. This Problem of Air Pollution. *American Foundryman*, v. 16, Dec. 1949, p. 22-24.

In connection with cupola-stack emission.

14A-183. First Principles of Gating: Progress Report on One of Nine Research Projects. *American Foundryman*, v. 16, Dec. 1949, p. 27-29.

Results of A.F.S. Research Project on fluid-metal flow confirm some techniques of gating and condemn others. Report to date refers only to gating practice applicable to castings having substantial lateral dimensions but relatively small vertical height.

14A-184. The Foundry Industry in Argentina. Macedonio Z. Lopez. *American Foundryman*, v. 16, Dec. 1949, p. 34-38.

14A-185. Modern Foundry Methods. *American Foundryman*, v. 16, Dec. 1949, p. 42-44.

Development of plaster-mold casting process for complicated cylindrical shapes on a production basis to tolerances within $\pm$ 0.005 in.

14A-186. Control Casting Distortion. Alfred E. Wells. *American Foundryman*, v. 16, Dec. 1949, p. 48-49.

Principles of casting distortion on the basis of a few basic shapes. Knowledge of these principles aids in prevention or minimization of distortion.

14A-187. A Study of the Principles of Gating. R. E. Swift, J. H. Jackson, and L. W. Eastwood. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 76-88.

Previously abstracted from preprint. See item 14A-55, 1949.

14A-188. Modern Foundry Core and Mold Ovens. Charles A. Barnett. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 181-201; discussion, p. 201-203.

Previously abstracted from preprint. See item 14A-54, 1949.

14A-189. Sand Properties vs. pH. Bradley H. Booth. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 210-220; discussion, p. 220-221.

Effect of successively larger additions of Na_2CO_3. It was found that pH value of a foundry sand does have an effect on sand properties.

14A-190. A Study of the Workable Green Strength of Core Mixtures. H. W. Dietert. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 386-391; discussion, p. 391.

Reports investigation undertaken to make test methods available which could be used to measure the ability of a core mixture in the green state to make a standing core, to carry an over-hang section, to resist cracking on rolling-out or on handling, and to resist sagging on handling.

14A-191. Scabbing Tendencies of Molding Sands. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 400-407; discussion, p. 407-408.

Progress report which indicates

that laboratory tests can be used to predict the above. Data on dry and hot compressive strength at 500° F. and on maximum strain value of green compression specimens show promise of correlation with scab defects.

14A-192. Casting Surface Finish. H. H. Fairfield and J. MacConachie. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 521-525; discussion, p. 525.

Previously abstracted from preprint. See item 14A-53, 1949.

14A-193. Plastic Binders for Foundry Sand Practice. H. K. Salzberg. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 357-365; discussion, p. 365-366.

Previously abstracted from preprint. See item 14A-52, 1949.

14A-194. Design and Operation of a 10-in. Diameter Cupola. D. E. Krause and H. W. Lownie, Jr. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 163-171; discussion, p. 171-172.

Previously abstracted from preprint. See item 14A-51, 1949.

14A-195. Causes of Rat-Tail Casting Defects. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 526-534.

Previously abstracted from preprint. See item 14A-50, 1949.

14A-196. Heat Transfer: A Foundryman's Tool. Victor Paschkis. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 310-314; discussion, p. 314.

Previously abstracted from *American Foundryman*, item 14A-101, 1949.

14A-197. Production and Consumption of Heat in the Cupola. D. W. Gunther. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 343-347; discussion, p. 347-353.

Previously abstracted from condensation in *Industrial Heating*, item 14A-102, 1949.

14A-198. Graphite Resistor Furnace Melting Practice. B. N. Ames and N. A. Kahn. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 157-161; discussion, p. 161-162.

Previously abstracted from preprint, item 16A-30, 1949.

14A-199. Risering Castings. J. B. Caine. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 66-75.

Previously abstracted from *American Foundryman*, item 14A-28, 1949.

14A-200. (Book) **Bibliography of Centrifugal Casting.** Howard F. Taylor and C. L. Register. 1949. American Foundrymen's Society, 222 W. Adams St., Chicago 6, Ill. $1.50.

Compares centrifugal casting with other casting methods and lists more than 300 articles, arranged by years of publication, and 500 patents. Contains a brief history of the development of centrifugal casting, a discussion of its fundamentals, and a list of 85 publications in which bibliographic references appear, together with names and locations of publishers and an author index.

14B—Ferrous

14B-140. Quality Control Review: Test Procedures for Quality Control of Gray Iron Castings. F. J. Walls. *American Foundryman*, v. 16, Nov. 1949, p. 51-59.

Tests on sands, core binders, etc., metallurgical control; gating systems; testing and sampling of coke; blast-air moisture content and pressure; charging practice; controlling and estimating carbon content; chill control; pouring practice; casting treatment and shakeout; destructive and nondestructive testing. 10 ref.

14B-141. Flow-Line Foundry. Gordon B. Ashmead. *Western Machinery and Steel World*, v. 40, Nov. 1949, p. 78-81, 98-99.

Equipment and procedures in manufacture of light and heavy steel castings.

14B-142. German Foundries; Plants and Practice During the War. *Iron and Steel*, v. 22, Nov. 1949, p. 487-490. Condensed from Sec. IV, BIOS Overall Report No. 15, "The Ferrous Metal Industry in Germany During the Period 1939-1945", by Geo. Patchin and E. Brewin.

Melting plant and practice, materials and equipment for molding and coremaking, foundry methods, production of iron and steel castings, and foundry mechanization.

14B-143. Southern Foundry Is Designed for Mass Production. *Foundry*, v. 77, Dec. 1949, p. 68-71, 249-251.

Procedures and equipment of gray-iron foundry.

14B-144. Segregation in Small Steel Castings. Harold F. Bishop. *Foundry*, v. 77, Nov. 1949, p. 74-77, 139-140; Dec. 1949, p. 72-77, 154, 156.

Pronounced segregation of carbon, and to a minor degree other alloying elements found in small steel castings adjacent to riser contacts. Centerline segregation is also found in long, slender cast sections which extend for a comparatively great distance from the riser. Typical examples and methods of prevention or minimization. Dec. issue: Effect of riser-contact design, use of exothermic and special knock-off riser cores, and effect of casting design.

14B-145. Modernized Cleaning Room Handles Wide Range of Castings. Robert H. Herrmann. *Foundry*, v. 77, Dec. 1949, p. 82-85, 218, 220, 222.

Procedures and equipment of ferrous castings cleaning room.

14B-146. Cast Iron. Arthur J. Caddick. *Mining Magazine*, v. 81, Nov. 1949, p. 271-276.

Recent progress in methods of production. Effects of different added elements in different amounts on properties and structures.

14B-147. Oxygen Enrichment in the Cupola. W. C. Newell. *British Cast Iron Research Association Journal of Research and Development*, v. 3, Oct. 1949, p. 103-108.

Analyzes probable results of oxygen enrichment. Results reported in the literature.

14B-148. Oxygen Enrichment in the Cupola. E. C. Evans. *British Cast Iron Research Association Journal of Research and Development*, v. 3, Oct. 1949, p. 109-118; discussion, p. 118-119.

Critical survey of published information, including effects on refractory consumption, cost of oxygen, and methods of oxygen production.

14B-149. Can the Carbon Content of Cast Iron Melts Be Raised? *British Cast Iron Research Association Journal of Research and Development*, v. 3, Oct. 1949, p. 147-151.

Discussion of paper by J. G. Pearce. See item 14B-105, 1949.

14B-150. Making a Large Multi-Cylinder Diesel Crankcase. Part I. Core-Making. J. F. Barnes. **Part II. Moulding.** F. E. Ironmonger. *Foundry Trade Journal*, v. 87, Nov. 10, 1949, p. 565-570; Nov. 17, 1949, p. 593-601.

Procedures of British firm.

14B-151. Swords to Ploughshares. A. R. Parkes. *Foundry Trade Journal*, v. 87, Nov. 24, 1949, p. 621-628.

Layout, equipment, and procedures of new British ferrous foundry. About 60% by weight of its production consists of plowshares.

14B-152. Practical Experience With a Hot-Blast Cupola Furnace Plant. Otto Mattern. *Foundry Trade Journal*, v. 87, Nov. 24, 1949, p. 629-633. Translated and condensed.

Previously abstracted from *Die Neue Giesserei*. See item 14B-134, 1949.

14B-153. Gates and Risers as Applied to Steel Castings. Eric R. Morgan. *Journal of the Birmingham Metallurgical Society*, v. 29, Sept. 1949, p. 153-172.

Design studied from the theoretical point of view. Results are applied to a critical discussion of existing types. 10 ref.

14B-154. Um Estudo Sobre a Maleabilizaçao do Ferro Fundido. (Study of the Malleabilization of Cast Iron.) Tomio Kitice. *Boletim da Associaçao Brasileira de Metais*, v. 5, July 1949, p. 389-399.

Factors determining the number and size of graphite nodules produced during malleabilization.

14B-155. Increase Refractory Life in Malleable Melting. M. J. Henley. *American Foundryman*, v. 16, Dec. 1949, p. 30-31.

Modified cupola charging equipment and method for laying the bottom which resulted in better refractory life.

14B-156. Ninth Annual Report on Investigation of Properties of Steel Sands at Elevated Temperatures. John P. Fraser and Peter E. Kyle. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 89-99.

Work done during the year 1948-1949 at Cornell University. Hot-compressive-strength characteristic of two sand mixtures over a wide range of temperatures and exposure times. Free-expansion characteristics of one sand mixture under slow heating and shock heating conditions.

14B-157. Comparative Solidification Studies. Victor Paschkis. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 100-107; discussion, p. 107-110.

Solidification rates of various steel shapes cast in sand.

14B-158. Blast Humidity as a Factor in Cupola Operation. D. E. Krause and H. W. Lownie, Jr. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 111-130; discussion, p. 130-132.

Previously abstracted from a condensation in *Industrial Heating*, item 14B-77, 1949.

14B-159. A Study of Insulating and Mildly Exothermic Antipiping Compounds Used for Steel Castings. S. L. Gertsman. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 332-340; discussion, p. 340-342.

Previously abstracted from preprint. See item 14B-46, 1949.

14B-160. Report of the Activities of the A. F. S. Cupola Research Committee. R. G. McElwee. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 384-385.

Slag and coke quality studies. Air pollution and the cupola, and the chill test for cupola operation. Lists articles published in *American Foundryman* dealing with work of the Committee.

14B-161. Prevention of Hot Tears in Thick-Walled Centrifugally Cast Steel Tubes. J. F. Wallace and J. L. Martin. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 450-455; discussion, p. 455.

Previously abstracted from preprint, item 3B-81, 1949.

14B-162. Growth and Scaling Characteristics of High-Silicon Cast Iron. W. H. White and A. R. Elsea. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 459-473; discussion, p. 473-474.

Previously abstracted from preprint. See item 14B-51, 1949.

14B-163. Influence de la température de décochage sur la graphitisation à l'etat solide des fontes blanches. (Influence of Shake-Out Temperature on the Solid-State Graphitization of White Cast Iron.) Gabriel Joly. *Fonderie*, Sept. 1949, p. 1725-1728.

Results of investigation. Method for determination of temperature of shake-out (which was varied from 190 to 760° C.).

14B-164. Défauts dans des poulies de grosses dimensions. (Defects in Large-Sized Pulleys.) Henry Gernelle and Pierre Nicolas. *Fonderie*, Sept. 1949, p. 1744-1746.

Several cases in these sand castings, giving suggested remedies in each case. Causes are either lack of sand permeability or improper metal composition.

14C—Nonferrous

14C-98. Casting and Machining Pure Silver Bottles. W. C. Ellis. *American Foundryman*, v. 16, Nov. 1949, p. 60.

Fifty pure silver bottles were required for the transportation of a rare chemical substance—a product of atomic research. Development of satisfactory procedures for making them. Metal molds were used.

14C-99. Continuous Casting at Bristol Brass. J. H. Hyde. *Iron Age*, v. 164, Dec. 8, 1949, p. 80-85.

Operation of the Rossi continuous-casting machine. Advantages resulting from installation of this unit and from mechanization of material-handling operations. Greater uniformity of analysis of continuously cast stock has been achieved.

14C-100. Centrifugal Casting of Nonferrous Alloys. Herbert Chase. *Foundry*, v. 77, Dec. 1949, p. 94-97, 127.

Equipment and procedures of Allis-Chalmers Mfg. Co.

14C-101. The Conversion of Existing Parts to Production by Die Casting. H. K. Barton. *Machinery* (London), v. 75, Nov. 24, 1949, p. 754-762.

A variety of die-cast parts and assemblies formerly made by stamping, forging, plastic molding, sand casting, etc. Design principles.

14C-102. Production Processes; Their Influence on Design. Part XLIX. Plaster-Mold Casting. Roger W. Bolz. *Machine Design*, v. 21, Dec. 1949, p. 141-145.

14C-103. Arc Melting Molybdenum-Rich Alloys. *Iron Age*, v. 164, Dec. 15, 1949, p. 82. Condensed from "A Study of Arc-Melted Molybdenum-Rich Chromium-Molybdenum Alloys", by H. D. Kessler and M. Hansen, *American Society for Metals*, Preprint No. 33, 1949.

Previously abstracted from original, item 14C-77, 1949.

14C-104. Problems in Bronze Foundry Practice. Austen J. Smith. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 45-50.

Previously abstracted from *Engineering*, item 14C-58, 1949.

14C-105. Recent Developments in Theory and Practice of Insulating Sleeves, Pads, and Risers for Non-Ferrous Casting. Kurt A. Miericke. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 204-207; discussion, p. 207-209.

Previously abstracted from preprint. See item 14C-31, 1949.

14C-106. Metal Melting and Its Relation to Gases in Metal. O. Edwin Decker. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 354-356; discussion, p. 356.

Previously abstracted from preprint. See item 14C-30, 1949.

14C-107. Gas-Fired Melting of Copper-Base Alloys in a Reducing Atmosphere. Donald C. Caudron. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 558-560; discussion, p. 560-561.

Previously abstracted from preprint. See item 14C-32, 1949.

14C-108. Problem of Gases in the Indirect-Arc Furnace Melting of Brass and Bronze. Martin G. Dietl. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 597-600; discussion, p. 600-601.

Previously abstracted from *American Foundryman*, item 14C-38, 1949.

14D—Light Metals

14D-63. Continuous Casting of Aluminium Alloys; Effect on the Physical Properties. J. Herenguel. *Metal Treatment and Drop Forging*, v. 16, Autumn 1949, p. 133-139.

Formation of cracks, presence of porosity, and structure of the solidified Al-alloy ingots cast by the semi-continuous process. The effect of continuous casting on wrought-alloy properties, including final appearance and ability to be hot worked.

14D-64. Magnesium Sand Casting. *Magazine of Magnesium*, Nov. 1949, p. 8-11.

Recommended foundry procedures and design considerations. Applications.

14D-65. Die Casting of Light Alloys. F. A. Fox. *Machinery Lloyd* (Overseas Edition), v. 21, Nov. 5, 1949, p. 89-93, 95, 97.

Procedures, equipment, choice of alloys, and applications.

14D-66. La Société de Fonderie d'Aluminium et d'Alliages Légers a créé à Arandon une usine de classe internationale. (Société de Fonderie d'Aluminium et d'Alliages Légers Has Established a Plant of International Importance at Arandon.) Maurice Victor. *Revue de l'Aluminium*, v. 26, July-Aug. 1949, p. 262-270.

Equipment and procedures of new French light-alloy foundry.

14D-67. Use of Hardeners in Producing Aluminum Alloy Castings. James D. Kline. *Foundry*, v. 77, Dec. 1949, p. 79, 222-225.

Various types and their applicabilities. Recommendations.

14D-68. Hot Facts on a Cold Subject. *Die Castings*, v. 7, Dec. 1949, p. 17, 53-54.

Die-cast Al grid with an inexpensive tumbled finish provides the main component of unique new ice-cube drawer. Die-casting method.

14D-69. Efficient Magnesium Castings—Their Design & Production. George H. Found. *Metal Progress*, v. 56, Dec. 1949, p. 833-840, 892.

Endurance, notch sensitivity, and creep of two common Mg casting alloys. Laboratory tests on relatively small specimens correlate closely with stresses existing in full-sized parts at failure. Preliminary designs can be modified so that there may be no portion substantially weaker than the rest. 15 ref.

14D-70. Rough Castings to Finished Piston in Less Than 3 Minutes. Gerald Eldridge Stedman. *Steel*, v. 125, Dec. 19, 1949, p. 78-79, 98.

Aluminum pistons for gasoline engines produced in record time by die casting and machining.

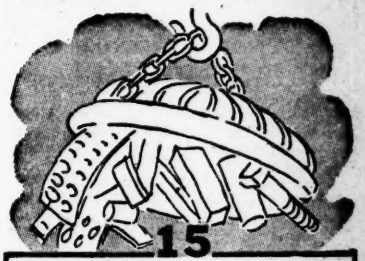
14D-71. Correlation of Cooling Curve Data With Casting Characteristics of Aluminum Alloys. E. E. Stonebrook and W. E. Sicha. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 489-496; discussion, p. 496.

Previously abstracted from preprint. See item 14D-22, 1949.

14D-72. Centrifugal Casting of Aluminum Alloys. J. W. Meier and O. Z. Rylski. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 602-631.

Results of a comparison of various static and centrifugal castings produced in the U. S. and Canada. Foundry equipment and investigations of molding sand, sprues, and gating. 18 ref.

For additional annotations indexed in other sections, see:
2B-317-356; 2C-100; 3B-282; 16A-113-114-116; 16B-118; 16D-5; 21C-10; 23C-71-76-77; 24D-30; 25C-76



SCRAP and BYPRODUCT UTILIZATION

15-77. Scrap Preparation. R. F. Fien. *Iron and Steel Engineer*, v. 26, Nov. 1949, p. 86-88; discussion, p. 88.

Efficient and inefficient methods. Recommends that scrap be baled or bundled, and all unprepared heavy scrap cut small enough to give plenty of weight in a buggy. This results in reduced number of buggies per heat and decreased charging time.

15-78. The Waste Pickle Liquor Problem. Wallace G. Imhoff. *Wire and Wire Products*, v. 24, Nov. 1949, p. 1040-1044, 1058-1059; Dec. 1949, p. 1127-1129, 1154-1159.

A review. 272 ref.

15-79. Repairing and Silver Plating Valuable Antiques. Ezra A. Blount. *Products Finishing*, v. 14, Dec. 1949, p. 12-16, 18, 20, 22.

Methods by which silver-plated articles are restored by a combination of mechanical and electroplating methods. Operations include stripping old plate, mechanical repairing, soldering, plating, buffing and burnishing, and lacquering.

15-80. Metallizing Repairs on Hydroelectric Equipment. John E. Wakefield. *Power Generation*, v. 53, Dec. 1949, p. 92, 94, 96.

Use of metallizing in the repair of worn and damaged hydraulic turbines and headgates.

15-81. Methods of Surveying Steel Plant Wastes. A. H. Arbogast. *Iron and Steel Engineer*, v. 26, Dec. 1949, p. 80-85; discussion, p. 85-87.

Installations for collection and treatment of the wastes.

For additional annotations indexed in other sections, see:
2B-339; 22A-286; 22B-418-424-460-465

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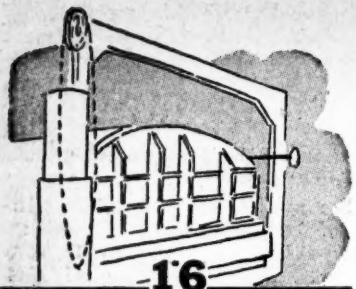


16 FURNACES and HEATING DEVICES

16A—General

16A-108. Production Economies Realized by Proper Use of Induction Heating. J. A. Evans. *Materials & Methods*, v. 30, Nov. 1949, p. 57-60.

Case histories demonstrate the versatility of induction heating and how its carefully planned use results in better and lower-cost heat treating and brazing.

16A-109. Non-Extinguishable Pilot Light for Combustion Processes. Walter G. Thompson. *Chemical Engineering*, v. 56, Nov. 1949, p. 131.

Burning takes place within a porous ceramic body. Value for high-velocity processes, including jet propulsion and blast furnaces.

16A-110. Graphite Resistor Furnace Melting Practice. *Industrial Heating*, v. 16, Nov. 1949, p. 1978, 1980. Condensed from paper by B. N. Ames and N. A. Kahn.

Previously abstracted from *American Foundrymen's Society*, Preprint No. 52. See item 16A-30, 1949.

16A-111. High Speed Gas Heating. (Concluded.) S. L. Case. *Steel Processing*, v. 35, Nov. 1949, p. 603-605.

Economic advantages as compared with conventional furnace methods of heating metals for forging. Economics also favor gas heating over induction heating. Use for brazing.

16A-112. Mullite and Zircon Furnace Tubes for High Temperature and High Vacuum Systems; New Method for Measuring Pressure. Earl A. Gulbransen and Kenneth F. Andrew. *Industrial and Engineering Chemistry*, v. 41, Dec. 1949, p. 2762-2767.

Design, construction, and testing of refractory porcelain furnace units of double-walled construction which can be sealed direct to a Pyrex glass vacuum system. Pressures of 10^{-9} mm. Hg or better can be obtained with these units at 1175° C. A new method for measuring performance of a furnace tube by measurement of rate of reaction of Zr with gases in the tube. 11 ref.

16A-113. The Principle of Recirculation of Gases as Applied to Mould and Core Drying Stoves. E. Watkinson. *British Cast Iron Research Association Journal of Research and Development*, v. 3, Oct. 1949, p. 67-82; discussion, p. 83-87.

Different types of furnaces and ovens; calculations and data on their performance, fuel consumption, operating efficiency, etc. Recirculation of gases results in more uniform temperature distribution and in reduced fuel consumption.

16A-114. The Use of Gas in the Foundry. A. C. Jennings. *British Cast Iron Research Association Journal of Research and Development*, v. 3, Oct. 1949, p. 121-128; discussion, p. 129-132.

Varied uses. Includes excellent equipment photographs.

16A-115. Protective Atmospheres in Industry. Parts XI and XII. A. G. Hotchkiss and H. M. Webber. *General Electric Review*, v. 52, Nov. 1949, p. 30-37; Dec. 1949, p. 46-54.

Part XI: General principles, procedures, and equipment for safe handling of protective atmospheres. Part XII: Typical heat treatment applications and new methods for bright annealing metals. (To be continued.)

16A-116. Infrared Oven Triples Core-Drying Capacity. *Steel*, v. 125, Dec. 19, 1949, p. 86.

16B—Ferrous

16B-103. How Oldsmobile Uses Induction Heat for Forging. Willard L. Mautz. *Iron Age*, v. 164, Nov. 17, 1949, p. 81-85.

Better forging-die life, savings in raw material, lack of scale, ease of stock handling, and cleanliness result from use of this method. Equipment and layout, and typical production data.

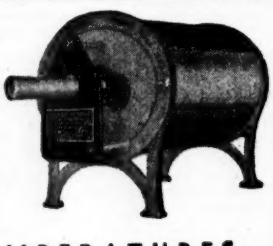
16B-104. British Investigations of Modified Cupola Designs. E. E. Renshaw and S. J. Sargood. *Iron Age*, v. 164, Nov. 17, 1949, p. 86-91.

Previously abstracted from *Foundry Trade Journal*. See item 16B-101, 1949.

16B-105. New Soaking Pit Installation Controls Ingot Temperatures Within Plus or Minus 10° F. Dan Reebel. *Steel*, v. 125, Nov. 21, 1949, p. 90-91.

Installation at Allegheny Ludlum Steel Corp. Dry mill scale is used for the bottom instead of coke. This

Fast Accurate Economical Dependable



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TECHNICAL BOOKS

Selected from the annotated listings in the A.S.M. Review of Current Metal Literature section of recent issues of *Metals Review*.

HARDENABILITY AND STEEL SELECTION. By Walter Crafts and John L. Lamont (Pitman)	$ 5.50
HOW TO CUT PRODUCTION COSTS. Edited by H. E. Blank, Jr. (Funk & Wagnalls)	4.50
STRUCTURAL DESIGN IN METALS. By Clifford D. Williams and Ernest C. Harris (Ronald)	6.50
ELEMENTARY METALLURGY AND METALLOGRAPHY. By Arthur M. Shrager (MacMillan)	4.75
CONVEYORS AND RELATED EQUIPMENT, Second Edition. By Wilbur G. Hudson (Wiley)	7.00
STAINLESS STEELS. By Carl A. Zapffe (A.S.M.)	5.00
PRINCIPLES OF METALLOGRAPHIC LABORATORY PRACTICE, Third Edition. By George L. Kehl (McGraw-Hill)	$ 5.50
INDUCTION HEATING. By N. R. Stansel (McGraw-Hill)	3.50
STORY OF MAGNESIUM. By W. H. Gross (A.S.M.)	2.00
WELDING FUNDAMENTALS. By H. P. Rigsby (Pitman)	2.75
STRUCTURE AND PROPERTIES OF ALLOYS. Second Edition. By R. M. Brick and Arthur Phillips (McGraw-Hill)	6.00
ALLOY SYSTEMS. By James Osborn Lord (Pitman)	5.00
BASING POINT SYSTEM. By Fritz Machlup (Blakiston)	5.00
STRENGTH OF MATERIALS. By C. O. Harris (American Technical Society)	4.90
MATHEMATICAL THEORY OF ELASTICITY. Fourth Edition. By A. E. H. Love (Dover)	5.95
MACHINING OF METAL. By Robert E. Smith (McKnight)	3.50
STEEL AND ITS HEAT TREATMENT: ENGINEERING AND SPECIAL-PURPOSE STEELS, Vol. III. Fifth Edition. By Bullens and Battelle (Wiley)	7.50
INDENTATION HARDNESS TESTING. By V. E. Lysaght (Reinhold)	5.50
METALLURGY AND MAGNETISM. By J. K. Stanley (A.S.M.)	4.00
MINERALS AND HOW TO STUDY THEM. Third Edition. By Edward Salisbury Dana. Rev. by C. S. Hurlbut (Wiley)	3.90
THEORY OF MODERN STEEL STRUCTURES: STATICALLY INDETERMINATE STRUCTURES AND SPACE FRAMES. Vol. II. By Linton E. Grinter (Macmillan)	5.25

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results in an extra long bottom life of 9-10 months.

16B-106. Annealing Stainless Clad Steel Sheets. E. W. Weaver. *Iron Age*, v. 164, Nov. 24, 1949, p. 77-80.

Annealing light-gage stainless-clad sheets by standard methods use for solid stainless or clad plate produced undesirable scale characteristics and made pickling difficult. New furnace produces a scale light enough to permit cutting the pickling time in half.

16B-107. Improved Metallurgical Properties Obtained by Rapid Quenching of High Manganese Steels at Damascus Steel Casting Co. *Industrial Heating*, v. 16, Nov. 1949, p. 1940-1942, 1944, 1946, 2080.

New 50-ton car-type furnace with side-dump tilting hearth and its use for automatic heat treating of high-Mn steels.

16B-108. Large Annealing Furnace Accommodates Two Railroad Cars at the General American Transportation Corp. Plant. Arthur Q. Smith. *Industrial Heating*, v. 16, Nov. 1949, p. 1950-1952, 1954, 1956.

16B-109. Blast Furnace Has All-Welded Earthquake-Proof Substructure. *Industrial Heating*, v. 16, Nov. 1949, p. 2046-2047.

Blast furnace in Chile.

16B-110. Heat Treating Railroad Tank Cars. Arthur Q. Smith. *Industrial Gas*, v. 28, Nov. 1949, p. 3-4, 25-26.

Huge gas-fired annealing furnace in which entire cars are heat treated.

16B-111. Automatic Gas-Fired Forge Furnaces. James R. Ross. *Steel Processing*, v. 35, Nov. 1949, p. 606, 614.

New furnace of Chevrolet Forge Div., General Motors Corp.

16B-112. O.H. Furnace Models. Part I. Flow Patterns in Ducts. J. H. Chesters and A. R. Philip. **Part II. Flow Visualization and Photography.** R. S. Howes and A. R. Philip. **Part III. Flow Patterns in Model Furnaces.** I. M. D. Halliday and A. R. Philip. *Iron and Steel*, v. 22, Nov. 22, 1949, p. 527-540; discussion, p. 598-601.

Previously abstracted from *Journal of the Iron and Steel Institute*. See item 16B-83, 1949.

16B-113. Gaseous Mixing; Experiments on Open-Hearth Furnace Models. R. D. Collins. *Iron and Steel*, v. 22, Nov. 22, 1949, p. 541-544; discussion, p. 598-601.

Previously abstracted from *Journal of the Iron and Steel Institute*. See item 16B-84, 1949.

16B-114. Some Aspects of Salt Bath Furnaces Discussed in Their Application to the Wire Industry. Parts One and Two. B. M. Pearson. *Wire Industry*, v. 16, Oct. 1949, p. 811, 813; Nov. 1949, p. 889-891, 893.

Various types of salt bath furnaces and their advantages and disadvantages. Different heat treatment processes used in the wire mill. Hazards and safety precautions. (To be continued.)

16B-115. Controlled Atmospheres for Forging and Tool Steels. Part I. Lester F. Spencer. *Steel Processing*, v. 35, Nov. 1949, p. 596-600.

Various types of equipment for production of controlled atmospheres. (To be continued.)

16B-116. Comparative Advantages of Modern Soaking Pits. E. A. Brown, Jr. *Industrial Heating*, v. 16, Nov. 1949, p. 1984, 1986, 1988, 1990, 1992, 1994, 1996.

Advantages and disadvantages of the various types. (To be continued.)

16B-117. Optimelt Automatic Recalibrating Control for Arc-Furnace Regulators. R. M. Bayle. *Journal of Metals* (Technical Section), v. 1, Dec. 1949, p. 14-19.

Electrical control system made by Westinghouse for use on d.c. arc furnaces for steel melting and refining. Advantages over hand regulation.

16B-118. Melts Steel in Oxygen—City Gas Fired Crucible Furnace. James M. Barrabee. *American Foundryman*, v. 16, Dec. 1949, p. 51-53.

Development of an efficient crucible furnace in which is possible, by using a mixture of city gas and oxygen, to produce sufficient heat to melt steel. The furnace was designed for use mainly in research work and special melting. Two methods for feeding fuel were used. The first provided for separate gas and oxygen inlets with mixing in an oval chamber at the bottom of the furnace. The second employed additional oxygen inlets and a different chamber to insure better mixing and more complete combustion.

16B-119. Metallurgical Control of Coil Annealing in Radiant Convector Furnaces. George B. Espey. *Iron and Steel Engineer*, v. 26, Dec. 1949, p. 99-107.

Advantages of the high-speed convection furnaces over older type, and their relative performance. Graphs and diagrams give temperature distributions, mechanical-property data, etc.

16B-120. A Hydraulic Method of Evaluation of the Quality of Metallurgical Coke. (In Russian.) K. I. Syskov and I. N. Nikolaev. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Aug. 1949, p. 1197-1208.

Newly developed method based on measurement of hydraulic properties, characterizing resistance of the mass of coke to movement of gases under conditions approximately corresponding to those of the blast furnace. Index of quality depends on toughness, uniformity of size of pieces, and amount of size reduction. 12 ref.

16B-121. Stufenversuche an einem schnellbeheizten Hochofenwinderhitzer. (Progressive Experiments With a Rapid-Heating Blast-Furnace Blast Heater.) Marcel Steffes. *Stahl und Eisen*, v. 69, Sept. 29, 1949, p. 687-691.

Study included all factors required for the evaluation of the heat balance and operating method. From the experimental data, two important indices were derived which can be used to estimate heating surface and the weight of the checker brick.

16C—Nonferrous

16C-16. Um Forno Aquecido por Combustao de Lenha para Copelacao de Chumbo. (A Lead-Smelting Furnace Modified for Use of Wood as Fuel.) Tharcisio D. de Souza Santos. *Boletim da Associaçao Brasileira de Metais*, v. 5, July 1949, p. 375-388.

Smelting furnace specially designed for use on Brazilian lead ores and for the burning of wood.

16D—Light Metals

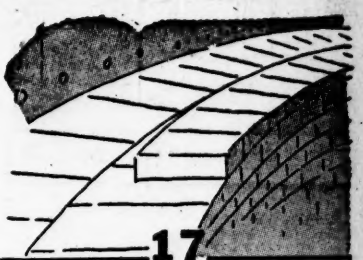
16D-5. The Induction Furnace for Melting Aluminum. James H. Hamnett. *Modern Metals*, v. 5, Nov. 1949, p. 25-28.

Over-all effects of induction melting of Al for use in high-pressure die casting.

16D-6. A New Plant Design for the Flash Annealing of Aluminum and Its Alloys. *Sheet Metal Industries*, v. 26, Dec. 1949, p. 2605-2607.

Continuous "flash annealing" furnace designed and built in Britain.

For additional annotations indexed in other sections, see: 14A-198; 14B-147-148-160; 18B-231



17 REFRACTORIES and FURNACE MATERIALS

17-107. Furnace Bottom Installed in 57 Hours in World's Largest Open-Hearth. H. N. Barrett. *Steel*, v. 125, Nov. 28, 1949, p. 56-58.

Bottom installation in Weirton Steel's 550-ton furnace. A rammed bottom was used. Pros and cons of the full rammed hearth and the subhearth with a "burned-up" top layer.

17-108. Specialties Solve Many Refractories Problems. F. W. Schroeder. *Refractories Journal*, v. 25, Oct. 1949, p. 346-350. Reprinted from *Modern Power and Engineering*.

Applications of so-called special refractories.

17-109. Basic Refractories; Their Chemistry in Relation to Their Performance. (Continued.) J. R. Rait. *Iron and Steel*, v. 22, Nov. 1949, p. 493-498.

Reviews the literature on the systems $CaO-SiO_2-Al_2O_3$; $CaO-SiO_2-Fe_2O_3$; $CaO-Al_2O_3-Fe_2O_3$; $CaO-Al_2O_3-SiO_2-Fe_2O_3$; $CaO-MgO-SiO_2-Al_2O_3$; $CaO-MgO-Al_2O_3-Fe_2O_3$; and $CaO-MgO-SiO_2-Al_2O_3-Fe_2O_3$. X-ray and microscopic investigations of the same system. 30 ref.

17-110. Refractories Cost Money Too. *Engineering and Mining Journal*, v. 150, Dec. 1949, p. 74-77.

Properties and economics of the various types of furnace refractories, with emphasis on their use in smelting operations.

17-111. Suggestions for a Glossary of Terms Relating to Refractories, Their Manufacture and Use. S. M. Phelps. *American Refractories Institute*, Technical Bulletin, No. 87, Oct. 1949, 19 pages.

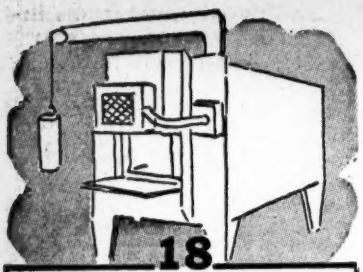
17-112. Cupola Refractories; A Review of the Literature. W. A. Archibald. *Iron and Steel*, v. 22, Nov. 22, 1949, p. 515-518.

71 references.

17-113. Étude des ciments pour mélangeurs à base d'oxychlorures et d'oxysulfates de magnésie. (Study of Oxychloride and Oxysulfate-Base Binders.) Paul Rocquet. *Revue de Métallurgie*, v. 46, Aug. 1949, p. 639-644.

The wear and abrasion resistance of the above materials were investigated in order to determine their respective suitabilities for joining refractory bricks or blocks used in metallurgical furnaces.

For additional annotations indexed in other sections, see: 2B-322



18 HEAT TREATMENT

18B—Ferrous

18B-225. Induction Heating Medium Carbon Steels. *Iron Age*, v. 164, Nov. 24, 1949, p. 76.

Based on "The Effect of Alloying Elements on the Transformation Characteristics of Induction Heated Steels", Joseph F. Libsch, Wen-Pin Chuang, and William J. Murphy. Previously abstracted from *American Society for Metals*, Preprint 21, 1949. See item 18B-168, 1949.

18B-226. The Carbonitriding Process of Case Hardening Steel. G. W. P. Rengstorff, M. B. Bever, and C. F. Floe. *Metal Progress*, v. 56, Nov. 1949, p. 651-656.

Effects of temperature and time on the composition and structure of the carbonitrided case. Some effects of variation in the gas composition, and advantages of carbonitriding over other case hardening processes.

18B-227. How to Heat Treat Chisel Steel. Arthur Walten. *American Machinist*, v. 93, Dec. 1, 1949, p. 85.

Recommended procedure.

18B-228. Oxy-Acetylene Flame Hardening in Commercial Heat Treatment. H. T. Howat. *Welding Journal*, v. 28, Nov. 1949, p. 1043-1052.

Methods, and materials which may be flame hardened. Typical applications.

18B-229. Carbon Steels; New Atmosphere for Decarburization-Free Treatment. P. F. Hancock. *Iron and Steel*, v. 22, Nov. 1949, p. 509-512.

Use of endothermic generator developed in the U. S. for production of atmosphere from city gas and air over a catalyst. Potential applications.

18B-230. Les recherches sur la trempe isotherme en France et à l'Etranger. (Research on Isothermal Hardening in France and Abroad.) (Concluded.) G. Delbart and M. Ravery. *Revue de Métallurgie*, v. 46, July 1949, p. 475-502.

Intermediate transformations, martensitic transformations, incubation, high speed steels, and relations between structure and mechanical properties. 162 ref.

18B-231. Homocarb Gas Cyaniding. *Western Metals*, v. 7, Nov. 1949, p. 35-37.

With the "Homocarb" furnace, heat treaters case harden parts made of low-carbon steel to specific dimensions. How the method works at two western plants.

18B-232. Induction Hardening of High Speed Steel Tools. (In Russian.) L. S. Livshits. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, July 1949, p. 27.

Optimum conditions for induction heat treatment of tools produced from high speed toolsteel. Comparative data for standard hardening and induction hardening of such toolsteels.

18B-233. Variations in the Quenching Power of Salt Baths. A. M. White. *Metal Progress*, v. 56, Dec. 1949, p. 819-824.

The quenching power of a commercial nitrate-nitrite salt bath is significantly increased by contamination with 0.5% sodium chromate, and decreased by small amounts of chloride. Results are based on a direct method of testing in which hardness of a stepped cylindrical specimen is used to indicate effectiveness of the medium in which the specimen is quenched. 11 ref.

18B-234. Air-Hardening Tool and Die Steels: Characteristics and Classification. C. B. Post. *Iron Age*, v. 164, Nov. 24, 1949, p. 63-67; Dec. 1, 1949, p. 91-94; Dec. 15, 1949, p. 91-95.

These steels offer greater freedom from cracking—especially in intricate sections—less distortion in heat treatment, a minimum of size change, and uniform through-hardening. Nov. 24 issue: General characteristics of the steels, which are separated into three classifications based on analysis and usage. Dec. 1 issue: Distortion factors, hardenability, and internal stresses resulting from water, oil, and air hardening. Concluding part: Typical applications.

18B-235. Scale Reduction in Controlled Atmosphere Cycle Annealing. C. A. Payntor. *Iron Age*, v. 164, Dec. 15, 1949, p. 86-90.

Techniques and furnace equipment used for reducing forging scale on steel parts to machinable limits simultaneously with a cycle annealing operation. Furnace construction details, atmosphere composition, furnace cycle, production rates and operation costs involved in handling parts of A8620 composition at rates up to 3400 lb. per hr.

18B-236. Hardening and Balancing Parts for IHC's Silver Diamond Engine. *Automotive Industries*, v. 101, Dec. 15, 1949, p. 41, 78.

Equipment and procedures for engine made by International Harvester.

18B-237. Graphitization of Gray Cast Iron by Heat Treatment. A. W. Silvester. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 51-65; discussion, p. 65.

Previously abstracted from preprint. See item 18B-62, 1949.

18B-238. Effects of Temperature and Silicon Content on First Stage Annealing of Black-Heart Malleable Iron. J. E. Rehder. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 173-177; discussion, p. 177-180.

Previously abstracted from preprint. See item 18B-74, 1949.

18B-239. Graphitizing Behavior of White Iron. S. C. Massari. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 226-231; discussion, p. 231-232.

Previously abstracted from *American Foundryman*, item 18B-92, 1949.

18B-240. Surface Hardening of Pearlitic Malleable Irons. S. H. Bush, W. P. Wood, and F. B. Rote. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 367-376; discussion, p. 376-377.

The above, varying widely in chemical composition, production practices, and microstructures were investigated for response to surface-hardening heat treatments. Flame and induction heating followed by oil, water, or spray quenching were used. Case hardness and depth were determined by Rockwell C measurements and metallographic examination of etched specimens.

18B-241. Influence of Rate of Heating on First Stage Graphitization of White Cast Iron. Richard Schneidewind and D. J. Reese. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 497-505; discussion, p. 505-508.

Previously abstracted from preprint. See item 18B-76, 1949.

18B-242. Influence of Silicon Content on Critical Temperature Range During Slow Cooling of Black-Heart Malleable Iron. J. E. Rehder. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 549-555; discussion, p. 555-557.

Previously abstracted from preprint. See item 18B-75, 1949.

18B-243. Controlled Atmosphere Annealing of Malleable Iron. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 562-564; discussion, p. 564-566.

Previously abstracted from preprint. See item 18B-61, 1949.

18B-244. Untersuchungen von Härteschwankungen durch statistische Verfahren. (Study of Hardness Measurements by Statistical Methods.) Otto Henstenberg. *Stahl und Eisen*, v. 69, Oct. 27, 1949, p. 765-767.

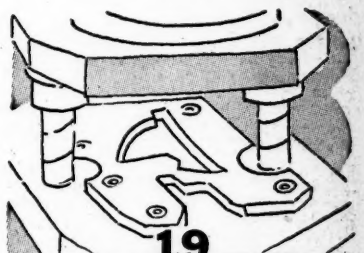
Statistical analysis was made of hardness variations with time of surface-hardened and quenched steels and of "degree of coincidence" of parallel hardness curves.

18C—Nonferrous

18C-14. Bright Annealing of Nickel Silver Accomplished on Production Basis. John W. Carter. *Materials & Methods*, v. 30, Dec. 1949, p. 56-58.

Scale-free, clean metal surfaces can be maintained during stress-relief annealing by careful selection of atmosphere and furnace equipment.

For additional annotations indexed in other sections, see:
2B-280; **3A**-247; **3B**-275-293; **3C**-252-266; **3D**-86-88; **4B**-134; **4C**-163; **4D**-70; **11**-398; **16A**-111; **16B**-106-107-108-110-115-119; **16D**-6; **19B**-230; **20B**-171-178-182; **22B**-421



19 WORKING

19A—General

19A-268. Cold-Rolled Sections; Some Aspects of Their Production and Their Applications in Industry. G. Warwick. *Sheet Metal Industries*, v. 26, Nov. 1949, p. 2341-2347.

19A-269. Die Lubrication During Metal-working Operations; Applications in the Forging and Stamping Industry. W. E. J. Cross. *Metal Treatment and Drop Forging*, v. 16, Autumn 1949, p. 141-145.

Requirements of die lubricants and advantages of use of colloidal graphite.

19A-270. A Review of Techniques in Drop Forging. *Metal Treatment and Drop Forging*, v. 16, Autumn 1949, p. 153-156.

19A-271. Rolls and Rolling. Part X. E. E. Brayshaw. *Blast Furnace and*

Steel Plant, v. 37, Nov. 1949, p. 1341-1346, 1348-1349, 1353.

Roll-pass design principles for production of hexagons from billets.

19A-272. Rolled Bars. Part III. Application of Spread Calculation to Diamond Passes. A. E. Lendl. *Iron and Steel*, v. 22, Nov. 1949, p. 499-501.

19A-273. A Rapid, Simple Method of Determining Shape of Wire Dies. Eugene M. Smith. *Wire and Wire Products*, v. 24, Nov. 1949, p. 1025-1026.

Method that appears to have all the advantages of those previously described, and none of their deficiencies. Facsimile impressions are obtained by use of a hard, dental, inlay-casting wax. The profile of the wax impression is examined visually or microscopically.

19A-274. Some Uses and Applications of Die Cushion Equipment in Presswork Production. W. Egginton. *Sheet Metal Industries*, v. 26, Nov. 1949, p. 2379-2384.

Design of equipment of various types. Limits on selection of the proper type.

19A-275. The Compression Test in Relation to Cold Rolling. N. H. Polakowski. *Journal of the Iron and Steel Institute*, v. 163, Nov. 1949, p. 250-276.

Part I: Significance of the static compression test is discussed, and wide discrepancies in existing comparative data. A multi-stage test method in which the specimens are repeatedly machined after approximately 25% compression is developed. By this method 90% reduction or more may be obtained under almost uni-axial conditions. Yield-stress curves of commercial Al, Cu, Armco ingot iron, five carbon steels and two low-alloy steels, both in the as-rolled and annealed conditions, were established. Part II: The compression test is analyzed in regard to initial critical shape of the specimens and subsequent elastic deformation of the compressing tools at high stresses. Deductions are applied to cold rolling. Some peculiar relations between external friction, roll force, torque, work of deformation, and speed effects are explained. 47 ref.

19A-276. An Investigation of Back-Pull Wire Drawing as an Industrial Technique. J. G. Wistreich. *Journal of the Iron and Steel Institute*, v. 163, Nov. 1949, p. 316-330.

A more complete version of article abstracted from *Wire Industry*. See item 19B-168, 1949.

19A-277. Production of Sheet Metal Components for Jet-Propulsion Units. *Machinery* (London), v. 75, Nov. 10, 1949, p. 667-672.

Procedures and equipment. The parts are stamped, deep drawn, rolled and welded. High-Ni alloys, stainless steel, and low-carbon steel are used.

19A-278. A Simple Forming Tool. F. Strasser. *Machinery* (London), v. 75, Nov. 10, 1949, p. 680.

Tool for final forming of components when the quantities required do not justify more elaborate and expensive arrangements.

19A-279. Stretch Formed Sheet Metal Parts. W. T. Kluge. *Western Machinery and Steel World*, v. 40, Nov. 1949, p. 90-93.

See abstract from *Light Metal Age*, item 19D-52, 1949.

19A-280. Cold Working Simplified by Lead-Lubrication Process. *Steel*, v. 125, Dec. 5, 1949, p. 114.

New method which can be used with low-carbon alloy and stainless steels and other metals. Typical applications are deep drawn parts of many kinds, steel cartridge cases, wire, tubing, etc. The material is simply coated with pure lead. The lubricating effect is reported to be remarkable.

19A-281. Draw Forming With Inexpensive Dies. J. J. Sloan. *Automotive Industries*, v. 101, Dec. 1, 1949, p. 40-43, 76.

Examples of deep drawing and waffle forming, particularly as applied to aircraft manufacture. Drop-hammer techniques as applied to waffle forming.

19A-282. Product Possibilities for the Cold Heading Process. *Product Engineering*, v. 20, Dec. 1949, p. 108-111.

Parts suitable for forming by cold heading; limitations on size, shape, and amount of upset; materials that can be used; tolerances that can be held; and other design data.

19A-283. New Forming Process Developed. *Steel Processing*, v. 35, Nov. 1949, p. 601, 617.

"Marform" process developed by Glenn L. Martin Co., and its applications. Principal feature is precision control of the pressure curve for the forming cycle. This control enables parts to be formed free of wrinkles and reduces springback to a minimum.

19A-284. Piercing and Notching Structural Angles. Ralph Weisbeck. *Tool & Die Journal*, v. 15, Dec. 1949, p. 66, 68, 72.

Simplified, independent, self-contained, hole-punching units.

19A-285. Specials Are Made to Do Tough Jobs. W. H. Hill. *Fasteners*, v. 6, no. 2, 1949, p. 2-5.

Various threaded fasteners of special design made by cold forging and heading of ferrous and nonferrous metals.

19A-286. Multi-hole Piercing of Parts in Small Quantities. *Machinery* (London), v. 75, Nov. 24, 1949, p. 739-743.

Several unusual methods and apparatus used in the piercing of holes of various sizes and shapes.

19A-287. Compression Test; Significance in Relation to Cold Rolling. N. H. Polakowski. *Iron and Steel*, v. 22, Nov. 22, 1949, p. 588-596; discussion, p. 605-607.

Previously abstracted from *Journal of the Iron and Steel Institute*. See item 19A-275, 1949.

19A-288. Wiredrawing. I. S. Morton. *Machinery Lloyd* (Overseas Edition), v. 21, Nov. 19, 1949, p. 68-78.

Historical development and underlying principles. Equipment and methods in use today.

19A-289. A New Approach to Investigation of the Effectiveness of Lubricants for the Working of Metals by Compression. (In Russian.) S. Ya. Veiler and L. A. Shriner. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 11, 1949, p. 325-328.

See abstract from *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), item 19A-149, 1949.

19A-290. Cold Rolling Technique; The Application of Theory and Experiment to the Practice of Rolling. 5. Resistance of Materials to Deformation. (Continued.) Hugh Ford. *Sheet Metal Industries*, v. 26, Nov. 1949, p. 2333-2340.

Use of compression and hardness tests for determination of the yield-stress curve. Effect of lubricant. Results for rolled copper strip. Compares results by the plane-compression test with other test results, and compares the yield-stress curve for cold rolling with homogeneous compression. (To be continued.)

19A-291. A Practical Workshop System for the Care and Maintenance of Press Tools. (Continued.) W. M. Halliday. *Sheet Metal Industries*, v. 26, Nov. 1949, p. 2385-2390.

Functions and action of stripping mechanisms, strippers for blanking-press tools, lubrication, and maintenance requirements. (To be continued.)

19A-292. The Use of Inclinable Punch Presses. (Continued.) J. I. Karash. *Tool & Die Journal*, v. 15, Nov. 1949, p. 60, 62, 64, 66, 68; Dec. 1949, p. 56, 58, 60, 62.

Nov. issue: Piercing die with jigger pin arrangement, inverted piercing die, compound die, and inverted compound die. Dec issue: Examples of a pilot-type piercing die, of a compound pilot die, of progressive dies (end and center cut-off), and of bending dies. (To be continued.)

19A-293. Manufacturing Intake Manifolds at Solar Aircraft Company. Gerald Eldridge Stedman. *Machine and Tool Blue Book*, v. 45, Dec. 1949, p. 83-84, 86, 88, 90, 92, 94, 96.

Blanking, forming, soldering, welding, and other operations.

19A-294. Mold Dies. 1. Mold Die Hobbing. Islyn Thomas and Edmund W. Spitzig. **2. Mold Finishing.** M. C. Overholt. *Tool Engineer*, v. 23, Dec. 1949, p. 26-28.

Design and procedures for a specialized phase of mold making sometimes known as "hubbing".

19A-295. A Machine That Helps to Make Its Own Dies. Cyril J. Bath. *Machinery* (American), v. 56, Dec. 1949, p. 173-174.

Curved steel shapes for a large variety of applications can be produced on the contour former. An unusual feature is that it can be used to produce the forming element of its own dies, which makes possible a substantial reduction in original cost of the dies.

19A-296. Spinning of Difficult Shapes Simplified by Use of Speed Chart. Herbert E. Edlund. *Materials & Methods*, v. 30, Dec. 1949, p. 47-49.

Use of direct-reading charts for metal-spinning speeds. These show relations of speeds to diameter and gage of blank for ductile material and for stainless and special materials.

19A-297. Better Press Performance Expected in Asymmetrical Deep Drawing Operations. W. T. Lankford, S. C. Snyder, and J. A. Bauscher. *Steel*, v. 125, Dec. 19, 1949, p. 82-84, 86.

See abstract from *American Society for Metals*, Preprint No. 30, 1949, item 19B-207, 1949.

19A-298. Das Fliesspressen von Hülsen in Rechnung und Versuch. (The Deep Drawing of Shells in Theory and Experiment.) Martin Dipper. *Archiv für das Eisenhüttenwesen*, v. 20, Sept.-Oct. 1949, p. 275-286.

Theoretical principles and the theoretically computed energy consumption with the energy actually consumed, the comparison indicating the efficiency of specific deep-drawing processes. 17 ref.

19A-299. Walzen-Anwärm-und-Kühlvorrichtungen an Feinblechgerüsten. (Heating and Cooling Devices on Light-Gage Sheet-Metal Rolling Mills.) Wilhelm Krämer. *Stahl und Eisen*, v. 69, Sept. 29, 1949, p. 711-712.

19B—Ferrous

19B-221. How Ford Stamps Lamp Parts. Frank W. Gawronski. *Steel*, v. 125, Nov. 28, 1949, p. 60-61.

Equipment and procedures.

19B-222. Plate Mill Modernization at Central Iron & Steel. John Anthony. *Iron Age*, v. 164, Nov. 24, 1949, p. 70-72.

Plate-mill capacity has been virtually doubled at the Harrisburg plant by adding a blooming and slabbing mill, together with soaking pits, continuous slab-heating furnaces, and

other improvements. Problems of the openhearth shop have also been simplified by eliminating need for many of the small-slab-size ingots and for bottom pouring.

19B-223. A Four-High Reversing Cold Strip Mill. Lloyd L. Wilson. *Iron and Steel Engineer*, v. 26, Nov. 1949, p. 71-74; discussion, p. 74-75.

Driven back-up rolls enable use of smaller working rolls, and with front and back tension. The result is a modern all-purpose mill.

19B-224. Modernization of the Steelton Blooming Mill. Russell M. Weigle. *Iron and Steel Engineer*, v. 26, Nov. 1949, p. 97-100; discussion, p. 100-103.

Pit furnaces; ingot handling; mill-motor control; and blooming-mill tables.

19B-225. Automotive Die Work. Paul Burt. *Western Machinery and Steel World*, v. 40, Nov. 1949, p. 94.

Adjusting sleeves and locking clamps for Ford steering assemblies are produced in progressive dies.

19B-226. New Rod Mill at Minnequa Works of the Colorado Fuel and Iron Corporation Ready for Operation. *Blast Furnace and Steel Plant*, v. 37, Nov. 1949, p. 1319-1326, 1334.

Includes layout diagram.

19B-227. Steel Strip Extension Gauge. *Sheet Metal Industries*, v. 26, Nov. 1949, p. 2348.

New electronic instrument for measurement of small reductions during rolling. Operation is based on variation in magnetic pattern.

19B-228. Flame Straightening, Forming and Cleaning Structural Steel. F. H. Dill. *Welding Journal*, v. 28, Nov. 1949, p. 1067-1069.

Uses of the oxy-acetylene flame.

19B-229. Presses Produce a Variety of Parts for Many Ships at Puget Sound Navy Shipyard. Howard E. Jackson. *Modern Industrial Press*, v. 11, Nov. 1949, p. 38, 40, 42, 44.

19B-230. New Techniques at Ford's Forge Plant. Joseph Geschelin. *Automotive Industries*, v. 101, Dec. 1, 1949, p. 38-39, 62, 64.

Extrusion forging of front spindles, automatic salt-bath transformation annealing of certain parts, and other significant operations.

19B-231. Heavy Forgings for Shipbuilding. R. C. Benson. *Steel Processing*, v. 35, Nov. 1949, p. 583-589.

Methods for production, including manufacturing limitations, types of forgings, and forgings requiring bending operations after forging.

19B-232. Open-Top Can Manufacture. Frank E Slade. *Machinery* (London), v. 75, Nov. 17, 1949, p. 712-715.

Layout of can-making line. Slitting, rolling, knurling, pressing, forming, soldering, flanging, seaming, testing, etc.

19B-233. Die Phosphatierung als Hilfsmittel bei der spanlosen Formung von Eisen und Stahl. (Phosphating as an Aid to the Noncutting Working of Iron and Steel.) Alfred Durer. *Archiv für das Eisenhüttenwesen*, v. 20, Sept.-Oct. 1949, p. 305-312.

Reviews literature and shows the numerous advantages of a zinc phosphate coat on iron and steel as an aid to the cold working of these metals. Proposed method reduces not only the internal stresses of the metal, but also prolongs the life of the die. 28 ref.

19B-234. Club Sandwich With Chopped Onion? *Mainspring*, v. 13, Dec. 1949, p. 1-4.

A popular exposition of the structural transformations occurring in drawing and patenting spring-steel wire. The title is explained on the basis of the statement that "the carbon in spring steel forms an iron carbide which, in small plates, teams up with plates of pure iron like a club sandwich, a number of which lie in the matrix of iron like the onions in the stew."

19B-235. Blooming Mill Operations at Keystone Steel & Wire. William Herman. *Iron and Steel Engineer*, v. 26, Dec. 1949, p. 88-91; discussion, p. 91.

The basic principle involved, which differs from the conventional practice, lies in the fact that ingots are rolled directly to small billets in one and the same pair of rolls.

19B-236. C. F. & I. Rod Mill Speeds Production. *Iron and Steel Engineer*, v. 26, Dec. 1949, p. 108-112.

Layout and equipment.

19C—Nonferrous

19C-26. L'Emboutissage des alliages de Cuivre; Das Tiefziehen von Kupferlegierungen. (Deep Drawing of Copper Alloys.) George Sachs. *Pro-Metal*, v. 2, Oct. 1949, p. 475-490.

Methods and processes, machines, dies, materials, and lubricants.

19D—Light Metals

19D-67. Étude des criques apparaissant au cours du laminage des billettes d'Aluminium 99.5 coulées. (Investigation of Cracks Appearing During Rolling of Cast 99.5% Aluminum Billets.) H. Jolivet and M. Armand. *Revue de Métallurgie*, v. 46, July 1949, p. 421-438; discussion, Aug. 1949, p. 567-568.

Macroscopic cracks formed during rolling are believed to begin with microscopic cracks present in the casting. Importance of Si-Fe ratio and of the presence of gaseous and oxide inclusions. Practical methods for minimizing crack formation. 30 ref.

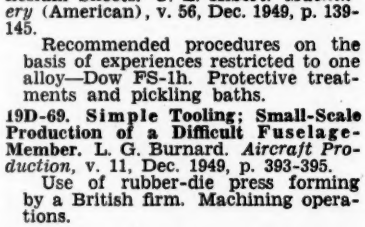
19D-68. How To Form and Join Magnesium Sheets. C. L. Hibert. *Machinery* (American), v. 56, Dec. 1949, p. 139-145.

Recommended procedures on the basis of experiences restricted to one alloy—Dow FS-1h. Protective treatments and pickling baths.

19D-69. Simple Tooling; Small-Scale Production of a Difficult Fuselage Member. L. G. Burnard. *Aircraft Production*, v. 11, Dec. 1949, p. 393-395.

Use of rubber-die press forming by a British firm. Machining operations.

For additional annotations indexed in other sections, see:
3A-247; 3A-263; 3B-279-293; 3D-86-87; 4C-163; 14A-174; 16B-103-111; 21C-10; 22B-427; 22D-80; 24A-158-159-161



20
MACHINING and MACHINABILITY

20A—General

20A-493. Novel Vise Jaws Increase Production. Robert Mawson. *Iron Age*, v. 164, Nov. 24, 1949, p. 80-81.

Slotted jaw designed for work on filister-head screws. It holds 30 screws at a time for slot machining.

20A-494. Design Considerations of Special Carbide Insert Holders. *Steel*, v. 125, Nov. 28, 1949, p. 76.

20A-495. Uniformity in Finished Work Promoted by Special Machine Designed to Perform Four Operations on Bicycle Pedal Crank. *Steel*, v. 125, Nov. 28, 1949, p. 72.

20A-496. Jig Borer for Navy Job Shop. James R. Langham. *Western Machinery and Steel World*, v. 40, Nov. 1949, p. 82-84.

Equipment at U. S. Navy Electronics Laboratory, Point Loma, Calif.

20A-497. More Western-Built Tools. *Western Machinery and Steel World*, v. 40, Nov. 1949, p. 86-89.

Machine-shop equipment and procedures in manufacture of woodworking tools.

20A-498. Automatic Sizing Applied to Plain Grinders. Wm. M. Stocker, Jr. *American Machinist*, v. 93, Dec. 1, 1949, p. 93-100.

Machine and gage manufacturers provide a variety of automatic size-control gages for cylindrical grinders. These increase production and lower costs, meanwhile holding closer limits than usual with manual control. Available types and their application to various grinding machines.

20A-499. Practical Ideas. *American Machinist*, v. 93, Dec. 1, 1949, p. 111-116.

Includes the following: strip-stock roll mount adjusts for pressure and register (F. H. Hartley); extra traversing accuracy provided by dividing head (Thomas C. Ash); rugged micrometer measures three-flute cutting tools (Leslie Morrissette); enlarging with counterbore eases large-hole drilling (Frank J. Peragine); two plugs check centers on intersecting holes (D. E. Sweet); vise bars clamp large number of round parts (R. Mery); notched stock cut in press with multiple-die formation (C. Jaikens); index-head setup produces turned spiral in plate (Bernard Levowich); rotating fixture on angle plate indexes parts for drilling (H. G. Frommer); chuck adapted to live center holds centerless parts (Allan B. Nixon); and other miscellaneous shop hints.

20A-500. Simple Indexing. Wm. H. Siebrecht. *American Machinist*, v. 93, Dec. 1, 1949, p. 127, 129, 131.

Table avoids need for extended calculations to find number of turns and crank travel required for any problem in simple or plain indexing.

20A-501. Turbine-Blade Production: Platform-Squaring and Root-Forming Operations; Honing and Polishing. *Aircraft Production*, v. 11, Nov. 1949, p. 362-369.

Second and concluding installment.

20A-502. Optically-Controlled Turning. *Aircraft Production*, v. 11, Nov. 1949, p. 376-381.

British lathe for machining of gas-turbine axial-flow-compressor casings.

20A-503. An Analysis of the Mechanics of Metal Cutting. D. C. Drucker. *Journal of Applied Physics*, v. 20, Nov. 1949, p. 1013-1021.

Attempts to go beyond an idealized description of the process of metal removal. The details of two-dimensional orthogonal cutting are investigated, and several concepts and hypotheses are introduced which apply equally well to the most general cutting operation. 12 ref.

20A-504. Precision "Borizing" Operations. *Machinery* (London), v. 75, Nov. 3, 1949, p. 647-648.

The term "borizing", as applied to Heald Borematics, covers boring, turning, facing, chamfering, and

grooving operations, using single-point cemented carbide tools at high speeds and fine feeds. Typical examples.

20A-505. The Economics of Machining Operations. J. M. Lickley and A. J. Chisholm. *Machinery* (London), v. 75, Nov. 10, 1949, p. 673-678.

Fundamentals of economical operation, tool-life data, manufacturing costs, analysis of machining costs, and practical limitations.

20A-506. Engineering Metal Pattern Equipment. H. A. Burton. *American Foundryman*, v. 16, Nov. 1949, p. 48-50.

Machine-shop methods for patterns. Merits of various metals.

20A-507. Efficient Tooling Innovations for Liquid Control Products. *Production Engineering & Management*, v. 24, Dec. 1949, p. 53-60.

Equipment and machine-shop procedures for production of gasoline pumps, vacuum stills and other liquid handling equipment.

20A-508. A Cost-Cutting Method for Generating Cam Forms. J. Harrington. *Production Engineering & Management*, v. 24, Dec. 1949, p. 61-64.

How contour sawing can be utilized to good advantage for processing cams for automatic machine-tool operations.

20A-509. Internal Work Clamping. Frank J. Peragine. *Production Engineering & Management*, v. 24, Dec. 1949, p. 70.

Fixture to be used where workpiece is to be machined on the outside diameter and the face, and the hole is to be bored and the bore chamfered. By clamping on the interior of the workpiece, all of the operations can be performed with one setup.

20A-510. Controlled Air Power Cuts Manufacturing Costs. J. G. McComb. *American Machinist*, v. 93, Dec. 15, 1949, p. 88-89.

Application to several machining production jobs.

20A-511. Optical Tools for Shop Precision. Charles Emerson. *American Machinist*, v. 93, Dec. 15, 1949, p. 91-98.

Fundamental principles and practical application of optical tools for measurement and inspection.

20A-512. Hand Lapping Still Pays Off. B. M. Peterson. *American Machinist*, v. 93, Dec. 15, 1949, p. 99-101.

Production of job-lot valve-bonnet and disk surfaces which require precise optical flatness—done with abrasive stones that themselves must be lapped to precise flatness.

20A-513. Pneumatic Tube Feeds Automatic Work Loader. J. W. Hillhouse. *American Machinist*, v. 93, Dec. 15, 1949, p. 101.

Use on a trimming lathe for small-part production.

20A-514. Water-Soluble Oil Proves Good Screw-Machine Lubricant. Ralph Hause. *American Machinist*, v. 93, Dec. 15, 1949, p. 105.

Favorable experiences.

20A-515. Practical Ideas. *American Machinist*, v. 93, Dec. 15, 1949, p. 109-114.

Includes the following: bench threading and tapping machine alters and finishes standard screws (R. B. Wolverhampton); automatic stamping machine marks soft metals (D. E. Sweet); disk gages check top rake on circular form tools (Otto V. Howe); electromagnetic table holds plates on boring mill (F. G. Forquer); second adapter speeds standard punch setup (Alfred Rheingold); combined turret tool does both straight boring and recessing (B. A. Lee); two pneumatic systems control shear blade and hold-downs (Ed Holbrook); combined boring-bar tools rough and finish in one pass (Charles A. Lauer); vertical ram press profiles simple flat workpieces (Dan J. Penway); tapered mandrel quickchecks washers and similar parts (Frederich Jerome); bearing housing finished by setting tool to surface gage (H. Moore); lathe cutter machines keyways (Lowell F. Stull); and other miscellaneous shop hints.

20A-516. Fixture for Grinding Concentric Conical Ends on Shafts. C. T. Bower. *Machinery* (London), v. 75, Nov. 17, 1949, p. 715.

20A-517. Boring "D" Shaped Holes. G. R. Ball. *Machinery* (London), v. 75, Nov. 24, 1949, p. 743.

Special apparatus and technique.

20A-518. Some Unusual Operations on Ryder Verticalautos. G. C. Batemen. *Machinery* (London), v. 75, Nov. 24, 1949, p. 744-749.

"Verticalautos" are a series of drill-press type machines made by a British firm. Operations performed include multiple-drilling, counterboring, and tapping; cross-drilling, and the turning of work between centers. Examples of tool layouts incorporating the new attachments.

20A-519. Taylor and High-Speed Cutting of Metals. *Current Digest of the Soviet Press*, v. 1, Nov. 29, 1949, p. 3-12.

Condensed translations from several current Soviet periodicals. The work of Frederick Taylor and of other Americans on the theory and practice of metal cutting is severely criticized, on the basis of both correctness and originality. Russians are said to have made prior discoveries in theory and practice. No technical information is included.

20A-520. Determination of Machinability of Metals. (In Russian.) E. I. Fel'dshtein. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, June 1949, p. 17-18.

Rapid method based on measurement of temperatures close to the cutting zone in both the cutting tool and the metal being cut. Thermocouple arrangement and typical results.

20A-521. Electromechanical Dial for Lathe Turning of Multistage Shafts. (In Russian.) A. I. Bolotin and P. D. Petrenko. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, June 1949, p. 19-20.

Device which relieves operator from measuring the shaft during work and automatically indicates longitudinal travel with accuracy up to 0.1 mm.

20A-522. Shaping of Teeth of Hardened Gears. (In Russian.) V. I. Korzinkin. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, June 1949, p. 21-23.

New, more rapid methods using a standard type of milling machine.

20A-523. Methods and Apparatus for Control of High-Precision Small-Diameter Boring. (In Russian.) I. A. Grigor'ev. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, July 1949, p. 1-7.

Precision and suitability of a series of mechanical, optical-mechanical, electrical and pneumatic devices. Structural details of these devices, and advantages, disadvantages and fields of application of each.

20A-524. Measurement of Angle of Taper of Cutting Edges of Arbitrary Shape. (In Russian.) S. A. Vinokurskii. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, July 1949, p. 11-14.

New method based on use of a double microscope.

20A-525. Circular Tangential Cutting Tools. (In Russian.) S. A. Rubinshtein. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, July 1949, p. 14-17.

Theoretical bases for design. Methods of determining optimum dimensions. Formulas are graphically interpreted. Sample calculations are performed.

JA-526. Some Unusual Grinding Operations. *Machinery* (London), v. 75, Dec. 1, 1949, p. 783-788.

Parts having interrupted cylindrical surfaces, multiple diameters, tapers, and many other forms can be economically finished on standard cylindrical grinding machines which have been suitably modified.

20A-527. Superfinishing. Part I. Application and Advantages; Producing High-Quality Finish Rapidly and Economically. Part II. Operating Conditions; Flat-Surface Superfinishing. E. J. Napier. *Aircraft Production*, v. 11, Nov. 1949, p. 385-388; Dec. 1949, p. 421-423.

Developments which have taken place in a British company and some of the advantages gained by use of superfinishing.

20A-528. Floating-Rotor Motor Utilized for Spindle Advance in Package Unit. *Machine Design*, v. 21, Dec. 1949, p. 135-136.

Semi-automatic indexing machine for drilling and tapping bicycle pedal cranks.

20A-529. Convertibility of Automatics Facilitates Small-Lot Production. *Machinery* (American), v. 56, Dec. 1949, p. 146-149.

Typical production setups using a new single-spindle automatic made by Cleveland Automatic Machine Co., which can easily and quickly be converted from a bar to a chucking machine.

20A-530. Rotary Tables Increase Flexibility of Horizontal Boring, Drilling, and Milling Machines. *Machinery* (American), v. 56, Dec. 1949, p. 180-182.

20A-531. Tool Engineering Ideas. *Machinery* (American), v. 56, Dec. 1949, p. 191-194.

"Milling Fixture for Right and Left-Hand Forgings", R. Mery; "A Milling Machine Turntable That Reduces Friction in Indexing", Robert Mawson; "Simple Measuring Tool for Quickly Determining Developed Lengths", Rogert Isetts; and "Faceplate Fixture for Boring an Unsymmetrical Casting", F. H. Scriber.

20A-532. Limited Production. 1. Economics of Limited Production. E. P. Blanchard. **2. Tools, Materials, and Methods for Limited Production.** J. B. Savits. **3. Quality Control of Limited Production.** C. D. Wright. *Tool Engineer*, v. 23, Dec. 1949, p. 20-25.

General principles applicable to small or medium manufacturing shops.

20A-533. Economic Factors in Milling. Mario Martellotti. *Tool Engineer*, v. 23, Dec. 1949, p. 29-33.

Recommended procedures for handling, storage, and grinding of milling cutters. Includes diagrams and charts. Selection of cutting speeds and work-holding methods.

20A-534. Gadgets. *Tool Engineer*, v. 23, Dec. 1949, p. 44-45.

"Offset Drill Head Extends Range of Drill Press", H. G. Frommer; "Automatic Machine Stop", A. H. Colombe; "Adjustable Spring Stripper", Robert D. James; "Collet for Polygonal Stock", E. Rodeck; and "To Shape or Drill Glass" (anon.).

20A-535. Special Tooling and Attachments for Brown & Sharpe Automatics. *Screw Machine Engineering*, v. 11, Dec. 1949, p. 30-34.

Three relatively complex parts and the setups necessary to produce them on the B. & S. automatic screw machine.

20A-536. Eight-Spindle Chucking Automatic Shortens Production Cycle. *Screw*

Machine Engineering, v. 11, Dec. 1949, p. 36-40.

Setups for producing complex part.

20A-537. Tooling Screw Machines With Carbides. J. S. Gillespie. *Screw Machine Engineering*, v. 11, Dec. 1949, p. 44-51.

Some of the fundamentals to be considered in setting up automatic screw machines with carbide tools for cutting steel. Data represents a summary of field reports from screw-machine manufacturers and the findings of comprehensive cooperative studies conducted with a leading user of automatic screw machines.

20A-538. Turret Lathe Practice. E. L. Murray. *Screw Machine Engineering*, v. 11, Dec. 1949, p. 54-59.

Applications of the cross-feeding hexagon turret lathe and standard tools available for use with it.

20A-539. Warner & Swasey Single Spindle Automatic Chucking Machine. *Screw Machine Engineering*, v. 11, Dec. 1949, p. 60-63.

Method of operation.

20A-540. Perform Difficult Operations Easier, Faster With Magnetic Chucks. H. Louis Purdy. *Machine and Tool Blue Book*, v. 45, Dec. 1949, p. 71-78.

An analysis of magnetic chucks and their uses, as well as both common and unusual applications.

20A-541. How Manufacturers Are Using Breaching to Increase Production and Reduce Costs. Herman Reichardt. *Machine and Tool Blue Book*, v. 45, Dec. 1949, p. 98-100, 102-104, 106-107.

A number of varied applications.

20A-542. (Book) Carbide Cutting Tools; How To Make and Use Them. Warren Baker and Joseph S. Kozacka. 416 pages. 1949. American Technical Society, Drexel Ave. at 58th St., Chicago. $5.50.

Designed primarily for the vocational student, the machine operator and the tool buyer. Design, manufacture, use, and maintenance of carbide forming or cutting tools, including the conversion of older machines, comparison with high speed tools, and names and characteristics of the different grades of carbide.

20B—Ferrous

20B-168. Special Fixtures Save Time in Machining Hercules Crankshafts. Robert Mawson. *Steel*, v. 125, Nov. 21, 1949, p. 92, 94.

20B-169. Special Machinery for Special Work. James Blane. *Western Machinery and Steel World*, v. 40, Nov. 1949, p. 74-77, 104-105, 110.

Machine-shop and welding equipment and procedures in fabrication of heavy steel equipment for tunnels, dams, and other large structures.

20B-170. Eliminating Loading Time. *Western Machinery and Steel World*, v. 40, Nov. 1949, p. 97.

Solution of the problem of broaching two well-separated bores accurately in line in forged steel steering knuckles.

20B-171. The Production of Motor-Car Pistons; Methods Employed at the Works of Vauxhall Motors, Ltd. *Machinery* (London), v. 75, Nov. 3, 1949, p. 631-637.

Machine-shop equipment and procedures. Use of induction hardening.

20B-172. Centreless Grinding Small-Diameter Work. *Machinery* (London), v. 75, Nov. 10, 1949, p. 679-680.

Use in needle production.

20B-173. 50-Millionths Clearance by Unskilled Workers. Chester S. Ricker. *American Machinist*, v. 93, Dec. 1, 1949, p. 101-103.

How different dimensions, different materials, and different heat treatments are produced rapidly and accurately by unskilled female workers.

20B-174. Developments in Gear Production. H. Pearson. *Engineering*, v. 168, Nov. 4, 1949, p. 487-490. A condensation.

See abstract from *Automobile Engineer*, item 20B-134, 1949.

20B-175. Automatic Recessing Tool. *Production Engineering & Management*, v. 24, Dec. 1949, p. 71.

Use of this tool gave 100% increase in production of heavy steel links.

20B-176. Diesel Manufacture; A Survey of the Production Methods Employed by Dennis Bros. Ltd. *Automobile Engineer*, v. 39, Nov. 1949, p. 477-484.

Miscellaneous machine-shop equipment and procedures.

20B-177. Grinding Small Screw-Cutting Tools. N. V. Samochvalov. *Industrial Diamond Review*, new ser., v. 9, p. 323-324. Translated from *Stanki i Instrument* (Machine Tools and Equipment), no. 7-8, 1946, p. 26-27.

Technique.

20B-178. The Production of Flywheel Ring Gears. *Machinery* (London), v. 75, Nov. 17, 1949, p. 703-708.

Machine-shop, welding, and heat treating equipment and procedure used by British automobile manufacturer.

20B-179. Rapid Machining With Tools Having Negative Rake. (In Russian.) N. D. Morozov. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, June 1949, p. 12-14.

Various designs of cutting tools with hard-metal tips for use in machining Cr-Mn-Si steel.

20B-180. Mechanism of Plastic Deformation During Machining of Steel. (In Russian.) S. F. Glebov. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, July 1949, p. 8-11.

A series of experiments in which cutting of polished and etched plates was observed under the microscope. Investigation was conducted with special attention to processes taking place in the zone of simultaneous deformation.

20B-181. Packard's Ultramatic Drive Built by Precision Methods. (Concluded.) E. G. Patzkowsky. *Machinery* (American), v. 56, Dec. 1949, p. 150-154, 163.

Machine-shop equipment and procedures.

20B-182. Low-Cost Production of Parts for Textile Looms. Edward F. Bahan. *Machinery* (American), v. 56, Dec. 1949, p. 166-169.

Miscellaneous setups. Includes flame annealing and tempering and machine-shop operations.

20B-183. Milling Hot Workpieces. A. O. Schmidt and J. R. Roubik. *Tool Engineer*, v. 23, Dec. 1949, p. 17-19.

Results of numerous tests in which the workpieces were heated on the milling machine by means of an oxy-acetylene torch. Heating decreases power requirements and makes possible increased rates. Combined with intermittent cutting (an inherent characteristic of milling) good tool life is obtained with carbides and cast alloys.

20C—Nonferrous

20C-24. Influence of the Nature of Metal on Facilitation of the Cutting Process by Use of Adsorbed Substances. (In Russian.) G. I. Epifanov, P. A. Rebinder, and L. A. Shreimer. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, June 11, 1949, p. 879-880.

Results of experimental investigation of aluminum, zinc, and bronze using different surface-active agents indicate that the softening action of such agents during plastic deformation of metals depends not only on chemical nature of the agents but also on nature of the metal.

20C-25. Hard, Tough Alloys Can Be Machined. Fred B. Sills. *American Machinist*, v. 93, Dec. 1, 1949, p. 84-85.

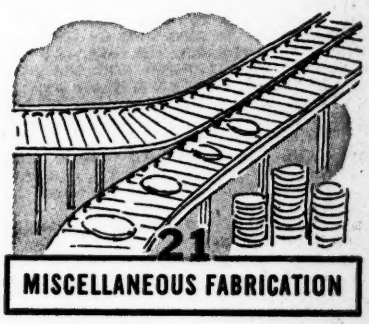
How ordinary turning, boring, and drilling operations can replace costly grinding for heavy stock removal on high-temperature alloys by use of carbide-tipped tools.

20C-26. Disk Grinder Face-Mills Small Parts. John C. Hanna. *American Machinist*, v. 93, Dec. 15, 1949, p. 86-87.

How a converted Besly disk grinder with a cutter in place of the usual grinding wheel eliminates normal grinding of small brass, bronze, and Al alloy valve parts before lapping for high finish.

20C-27. Machining Nimonic: Notes Based Upon Current Practice in the Processing of the Wiggin Series of High-Nickel Alloys. *Aircraft Production*, v. 11, Dec. 1949, p. 399-404. **Machining the Nimonic Series of Alloys: Results of a Survey Undertaken by Henry Wiggin & Co., Ltd.** *Machinery* (London), v. 75, Dec. 1, 1949, p. 775-782.

For additional annotations indexed in other sections, see: 12-231-232; 14C-98; 14D-70; 19D 69; 20A-506



21A—General

21A-61. How To Sell the Western Automotive Industry. *Western Metals*, v. 7, Nov. 1949, p. 25-31.

First of a series of analyses of major western industries which offer strong potential markets to western metalworking plants. Varied equipment and procedures at different western plants.

21A-62. Power Impact Tools Are Key to Lower Assembly Costs. A. G. Ringer. *Fasteners*, v. 6, no. 2, 1949, p. 6-9.

Miscellaneous uses in application of fasteners, or in the tapping of holes.

21B—Ferrous

21B-79. Fabrication of Apartment Size Ranges. Walter Rudolph. *Modern Industrial Press*, v. 11, Nov. 1949, p. 18, 22.

Press, machine-shop, riveting, buffing, and assembly operations.

21C—Nonferrous

21C-10. Continuous Casting Teamed With Cold Rolling Affords Improved Product Quality and Economy of Operation. *Steel*, v. 125, Dec. 19, 1949, p. 74-77, 106.

New production line of Scovill Mfg. Co. which organizes, in one straight flow, all the equipment necessary for producing cold-rolled brass, from flat-metal casting to packaging of the finished strip and

sheet. Operational sequence begins with electric induction-heating units followed by continuous casting; bar corner milling; two-high roughing; annealing; bar-surface milling; four-high rundown; annealing, pickling, and cleaning; four-high finishing; further annealing; pickling and cleaning; inspection, slitting, and packaging.

21D—Light Metals

21D-18. (Book) Aluminum and Magnesium Design and Fabrication. R. Burt Schulze. 589 pages. 1949. McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y. $7.50.

Processing, manufacturing methods, and costs. Machining, welded and bonded fastenings, and finishing.

For additional annotations indexed in other sections, see: 7A-212; 22A-265; 23D-143; 24A-164

22 JOINING and FLAME CUTTING

22A—General

22A-260. Automatic Testing of Arc Welding Electrodes. *Iron Age*, v. 164, Nov. 24, 1949, p. 73-74.

Apparatus eliminating entirely the human factor, developed by the Naval Engineering Experimental Station at Annapolis.

22A-261. High-Current Arcs. *Metal Progress*, v. 56, Nov. 1949, p. 738, 740, 742. Condensed from "The High-Current Carbon Arc and Its Mechanism", by Wolfgang Finkelnburg, *Journal of Applied Physics*, v. 20, May 1949, p. 468-474.

Properties of the contracted arc stream and a general theory. Application to arc welding.

22A-262. Correctly Designed Jigs and Fixtures Can Cut Welding Costs. *Steel*, v. 125, Nov. 28, 1949, p. 62-65.

Correct selection of materials, including use of nonmagnetic cast iron; provision for water cooling, electrode wear, ease of loading. Details of fixtures for specific cases.

22A-263. Welding Process Extended to Stainless Steel Applications. *Steel*, v. 125, Nov. 28, 1949, p. 75.

Aircomatic process has been successfully applied to Cr-Ni and stainless steels and to Al bronzes. The process involves continuous feeding of a coiled-wire electrode in a gaseous shield through the barrel of a welding gun.

22A-264. Limits of Welding Positions. W. L. Warner. *Welding Journal*, v. 28, Nov. 1949, p. 1040-1042.

It is often desirable from the standpoint of inspection, procedure, control, or production planning that the dividing lines to distinguish between positions be established. A basis for standardization is offered.

22A-265. Controlled Distortion—An Aid to Metal Working. Joe L. Morris. *Welding Journal*, v. 28, Nov. 1949, p. 1080-1082.

Several of the many ways in which distortion resulting from controlled heat applications may be applied advantageously in welding and other fabrication.

22A-266. Development of Specimen Simulating Weld Heat-Affected Zones. Ernest F. Nippes and Warren F. Savage. *Welding Journal*, v. 28, Nov. 1949, p. 534s-546s.

Design and construction of a time-temperature control device for exact duplication of weld heat-affected structures for testing purposes. Typical data records and recommendations for further work.

22A-267. Comparison of Radiation From Argon-Arc Welding With That of Metallic-Arc Welding. E. van Someren and E. C. Rollason. *Welding Journal*, v. 28, Nov. 1949, p. 566s.

See abstract from *Transactions of the Institute of Welding*, item 22A-169, 1949.

22A-268. Welding in the U.S.S.R. *Welding*, v. 17, Nov. 1949, p. 476-485.

Correlated review of a number of papers recently published in the Russian journal *Avtogennoe Delo*. 31 ref.

22A-269. Power Supply for Metal Arc Welding. C. A. Kershaw. *Welding*, v. 17, Nov. 1949, p. 486-492.

Welding characteristics of both a.c. and d.c. supply systems are considered with reference to developments which have taken place to overcome the disadvantages of a.c. Effects of introducing condensers for power-factor correction are discussed together with the question of unbalance on the 3-phase mains when using single-phase welding transformers.

22A-270. Cyc-Arc Stud Welding. *Machinery* (London), v. 75, Nov. 10, 1949, p. 681-682.

Procedure and equipment.

22A-271. A Survey of Principles, Applications and Developments of the Argon-Arc Welding Process. W. K. B. Marshall. *Sheet Metal Industries*, v. 26, Nov. 1949, p. 2427-2432, 2434, 2436, 2438, 2440.

Arc characteristics, equipment, design and technique, application to various metals, economics, advantages and disadvantages, and new developments.

22A-272. La conception des appareils à pression soudés à double enveloppe. (The Design of Equipment for Pressure Welding of "Double-Envelope" Joints.) H. Gerbeaux. *Soudure et Techniques Connexes*, v. 3, May-June 1949, p. 101-114.

Equipment consisting of two parallel shells joined together at the edges to form a closed system, such as a vacuum jacket, requires special welding apparatus and technique for construction. Various types of these joints as applied to different vessels. Mathematical analysis of stresses and strains developed and results of their experimental investigation.

22A-273. The Use of Jigs, Fixtures, Clamps, Positioning and Turning Equipment, and Operator Safety and Comfort Are Important Factors When You Are Aiming at Lower Welding Costs. Clayton B. Herrick. *Industry and Welding*, v. 22, Dec. 1949, p. 20, 23-24, 44, 46.

22A-274. High Production of Small Compressors. Part II. Paul M. Giles. *Industry and Welding*, v. 22, Oct. 1949, p. 36, 46.

Soft soldering, induction heating shrink fit, four-station dial feed, and compressor assembly. (To be concluded.)

22A-275. Argon-Arc Welding; A Survey of the Process and Recent Developments. W. K. B. Marshall. *Automobile Engineer*, v. 39, Nov. 1949, p. 493-495.

See abstract from *Sheet Metal Industries*, item 22A-271, 1949.

22A-276. Standardized Equipment for Resistance Welding. Wallace A. Stanley. *Welding Engineer*, v. 34, Dec. 1949, p. 34-40, 42.

Summary of chief types of welding machines and power-supply systems.

22A-277. Dies and Press for Jointing Steel-Cored Aluminium Cables. *Engineering*, v. 168, Nov. 18, 1949, p. 529-531.

Equipment is said to overcome difficulties inherent in previous methods and to insure good electrical and mechanical continuity of both the steel and the aluminum sections.

22A-278. Stud Welding. C. C. Macfarlane. *Transactions of the Institute of Welding*, v. 12, Oct. 1949, p. 110-115.

Four types of modern stud-welding equipment, and results achieved in a wide range of applications.

22A-279. The Reclamation of Worn Parts. Sheila M. Holgate. *Journal of the Birmingham Metallurgical Society*, v. 29, Sept. 1949, p. 173-186.

The three basic methods for rebuilding surfaces worn down by friction and abrasion are: welding, electrodeposition, and metal spraying. Application to both ferrous and nonferrous base metals. 27 ref.

22A-280. Un aspect curieux de microstructure d'une soudure autogène. (A Curious Aspect of the Microstructure of an Autogenous Weld.) H. Figour. *Revue de Métallurgie*, v. 46, Aug. 1949, p. 637-638.

Two welds were made in Fe-Ni-Co alloy sheet 1 mm. thick. One was made with the ordinary oxy-acetylene torch procedure; the other in an argon atmosphere. Mechanical polishing revealed no difference in structure, but etching revealed a peculiar cellular structure in the former samples.

22A-281. Les flux gazeux. (Gaseous Fluxes.) B. Liebesmann. *Zeitschrift für Schweisstechnik; Journal de la Soudure*, v. 39, Nov. 1949, p. 198-201.

See abstract of "Gaseous Fluxes in Welding, Weld-Brazing, and Brazing of Metals and Alloys" (in German) from *Soudure et Techniques Connexes*, item 22A-168, 1949.

22A-282. Das Festigkeitsverhalten von Schweissungen. (The Strength Behavior of Welds.) E. Siebel. *Schweissen und Schneiden*, v. 1, Aug. 1949, p. 121-128.

Several problems, especially effects of local distortions and internal stresses. Methods and apparatus for measuring internal stresses.

22A-283. Method for Determination of Basic Criteria of the Electrode-Melting Process, During Electric-Arc Welding. (In Russian.) G. D. Shwchenko. *Avtogennoe Delo* (Welding), July 1949, p. 16.

Theoretical method of determining coefficients of fusion and of deposition of electrode metal in grams per ampere-hour of arc combustion.

22A-284. Temperature of the Welding Arc. (In Russian.) K. K. Khrenov. *Avtogennoe Delo* (Welding), Aug. 1949, p. 14-15.

Derivation of well-known equation $T = kV_1$ where T is the temperature of the gas column in the arc, V_1 is the average effective ionization potential of the arc gas, and k is a constant.

22A-285. A New Flame Cutter. L. G. Buckle. *Engineers' Digest*, v. 10, Nov. 1949, p. 403-404.

New hand torch developed by a British firm. It is designed to take advantage of the heat provided by the metal in combustion thus re-

ducing gas consumption. Oxygen savings of 11-40% and fuel-gas savings of 43-84% are reported on the basis of experiences of various organizations.

22A-286. Heliarc and Railroad Applications. H. E. Gannett. *Welding Journal*, v. 28, Dec. 1949, p. 1147-1151.

Use in repair of cast iron and aluminum parts.

22A-287. Analyzing Metal Transfer in Arc Welding. R. C. McMaster, D. C. Martin, and A. Leatherman. *Welding Journal*, v. 28, Dec. 1949, p. 575s-583s.

Gives details of new instrument developed for the above. It is particularly well suited to studies of the influence of coating constituents on arc stability and metal transfer. 34 ref. (See abstract of condensed version, *Electrical Engineering*, item 22A-177, 1949.)

22A-288. Details of Some Recent Developments in the Joining of Sheet Material by Spring-Joint Methods. W. Cookson. *Sheet Metal Industries*, v. 26, Dec. 1949, p. 2573-2576.

New types of spring and lock joints and their use in erection of an Al-alloy house, of Al-alloy partitions, and Al roofing. It has been possible to develop joint members made of sheet material, so designed that sufficient spring action is obtained to enable them to be sprung together without overstraining, by hand pressure, to make a tight joint. (To be continued.)

22A-289. Causes and Cures of Common Welding Problems. *Materials & Methods*, v. 30, Dec. 1949, p. 83, 85.

Summarized in tabular form.

22A-290. The Progress of Structural Welding. Arsham Arimikian. *Industry and Welding*, v. 22, Dec. 1949, p. 36-38, 47.

Review of progress and suggestions for improvements. (To be continued.)

22B—Ferrous

22B-409. Hardfacing Sand Muller Plows. *Iron Age*, v. 164, Nov. 17, 1949, p. 102.

Use of a tungsten-carbide type facing multiplied useful life of parts at least 32 times.

22B-410. Powder Cutting Buttons and Skulls. R. Smith. *Iron Age*, v. 164, Nov. 24, 1949, p. 68-69.

How Colorado Fuel & Iron applies powder cutting to chunks up to 60 in. thick for reduction to openhearth charging size. Cost data.

22B-411. Weld Repairing Heavy Truck Castings. *Iron Age*, v. 164, Nov. 24, 1949, p. 82.

Procedure for repair of Cr-Mo cast-steel arms of Elwell-Parker truck.

22B-412. Staybolt Application and Maintenance. *Railway Mechanical Engineer*, v. 123, Nov. 1949, p. 642-645.

Locomotive-boiler staybolt threading standards; application of staybolts; seal welding of staybolts, and maintenance of staybolts.

22B-413. Developments in Automatic Hard Facing. H. W. Sharp. *Welding Journal*, v. 28, Nov. 1949, p. 1037-1039. A condensation.

Fields of application of automatic hard facing and methods of operation.

22B-414. Oxygen-Acetylene Scarfing in the Steel Mill. George Mersot. *Welding Journal*, v. 28, Nov. 1949, p. 1052-1055.

Current practices in surface conditioning of steel, and procedures for conditioning various steel products by scarfing.

22B-415. Welding Metallurgy—Iron and Steel. Chapter 3. Welding Methods and Processes. O. H. Henry, G. E. Claussen, and G. E. Linnert. *Welding Journal*, v. 28, Nov. 1949, p. 1056-1064.

Reprinted from 2nd edition of book published by American Welding Society, 1949. See item 22B-217, 1949.

22B-416. Welding Conserves Steel. T. R. Mullen. *Welding Journal*, v. 28, Nov. 1949, p. 1064-1066. Reprinted from *Engineering News-Record*.

How welding saves steel in structural plate girders, trusses, bunkers, etc.

22B-417. Cam Plates, Pallets & Wedges. *Welding Journal*, v. 28, Nov. 1949, p. 1083-1084.

Used on Naval Ordnance gun mounts. Aluminum bronze hardsurfacing procedures.

22B-418. Welding Old Iron Castings. Rene D. Wasserman. *Welding Journal*, v. 28, Nov. 1949, p. 1084-1085.

Recommended repair procedures.

22B-419. The Quickest and Cheapest Way to Make a Box Beam. *Welding Journal*, v. 28, Nov. 1949, p. 1086.

Unionmelt procedure.

22B-420. Hard-Facing vs. Wear. W. C. Owens. *Welding Journal*, v. 28, Nov. 1949, p. 1086-1087.

Recommended procedure for earth-moving tools (hand or power-operated).

22B-421. Cracking in Heavy Forged Flanges of Oil Separators. H. B. Fergusson and P. L. J. Leder. *Welding Journal*, v. 28, Nov. 1949, p. 521s-526s.

Severe restraint in heavy flanges coupled with steep thermal gradients in the welding of 3-in. forged flanges of gas and oil separators presented a difficult welding problem which was solved by preheating and stress relieving. Photomicrographs and sulfur prints show defects and general structures.

22B-422. Fractographic Structures in Weld Metal. C. A. Zapffe and C. O. Worden. *Welding Journal*, v. 28, Nov. 1949, p. 527s-533s.

How toughness of weld metal deposited from various types of electrodes can be qualitatively rated on the basis of fractographic pattern. Conclusions are based on a preliminary survey of mild steel weld fractures in beads from common electrode types. 10 ref.

22B-423. Cooling Rates in Arc Welds in ½-In. Plate. Ernest F. Nippes, Lynn L. Merrill, and Warren F. Savage. *Welding Journal*, v. 28, Nov. 1949, p. 556s-564s.

Experimental and mathematical investigations of temperature, temperature gradient, and cooling rate at points adjacent to an arc weld in ½-in. steel plate.

22B-424. Heavy Section Scrap Cutting. E. M. Holub. *Blast Furnace and Steel Plant*, v. 37, Nov. 1949, p. 1335-1336.

Powder cutting of lumps of steel 5-6 ft. thick to produce pieces small enough to be charged to the openhearth, using the Oxweld C-60 blowpipe.

22B-425. Salvaging a Liner. *Welding*, v. 17, Nov. 1949, p. 508-510.

Welding techniques for reconstruction of the fire-ravaged "Monarch of Bermuda".

22B-426. Automatic Hard Facing Speeds Production Over Manual Methods. William Price. *Materials & Methods*, v. 30, Nov. 1949, p. 64-65.

Use of submerged-arc welding for hard facing will often result in lower unit costs and more uniform deposits.

22B-427. Automatics Weld Spinner-Tub Assemblies. Fred Gandert. *American Machinist*, v. 93, Dec. 1, 1949, p. 104-107.

Picture story shows how hand-welding techniques have been replaced by automatic submerged-arc and coated-electrode welders, in conjunction with resistance spot welders. Includes press operations.

22B-428. New Melting Shop at Abbey Works for the Steel Company of Wales Ltd. J. Warley. *Welder*, v. 18, July-Sept. 1949, p. 51-54.

Use of welding in construction.

22B-429. 250-Ton Horizontal Press. J. E. Willey. *Welder*, v. 18, July-Sept. 1949, p. 55-57.

Use of welding in construction.

22B-430. Castellated Beams. *Welder*, v. 18, July-Sept. 1949, p. 58-59.

Construction by flame cutting and welding of a special type of structural member of superior strength properties.

22B-431. Automatic Stud Welder for Steel Truss Cords. *Sheet Metal Worker*, v. 41, Nov. 1949, p. 38.

17-gun stud welder used to secure fasteners to a crimped section which forms the bottom chord of half-roof trusses, 15 ft. 6 in. long.

22B-432. Electronics Open New Fields for Presses in Manufacture of Ford Station Wagon Units. P. D. Aird. *Modern Industrial Press*, v. 11, Nov. 1949, p. 13-14, 16, 52.

Use of presses to bond wood to steel, using adhesive resins.

22B-433. Soudabilité et ductilité. (Weldability and Ductility.) A. B. Kinzel, D. Swan, and H. Biers. *Soudure et Techniques Connexes*, v. 3, May-June 1949, p. 115-124; discussion, p. 124-126.

Literature review; theoretical considerations; experimental methods; experimental results and certain conclusions concerning the effects of various factors on the ductile or nonductile behavior of welded structures.

22B-434. Récents essais faits en Suisse en matière de soudure oxy-acétylénique de l'acier. (Recent Experiments on Oxy-Acetylene Welding of Steel in Switzerland.) C. G. Keel. *Soudure et Techniques Connexes*, v. 3, May-June 1949, p. 127-137.

A forehand welding procedure followed by torch heat treatment of the weld while still hot. The temperature is raised to above the Ac_3 point, resulting in considerable increase of the fatigue strength of the weld.

22B-435. The Influence of Core Wire on the Characteristics of Low Carbon Steel Welding Electrodes. C. B. Voldrich, D. C. Martin, and P. J. Rieppel. *Yearbook of the American Iron and Steel Institute*, 1949, p. 397-458; discussion, p. 459-468.

Previously abstracted from preprint. See item 22B-172, 1949.

22B-436. Automatic Stud Welder Slashes Operation Time. *Production Engineering & Management*, v. 24, Dec. 1949, p. 65-66.

How 17 studs are automatically welded to the bottom chord of trusses in a machine-cycle time of 6 sec.

22B-437. Railroad Shop Welding. Fred M. Burt. *Welding Engineer*, v. 34, Dec. 1949, p. 24-27.

Procedures and equipment of Southern Pacific's Los Angeles shops. Welding, hard facing, inspection, flame hardening, flame cutting, and metallizing.

22B-438. Multiple-Section Welded Stampings Cut Auto Finishing Costs. R. H. Bennewitz and F. J. Pilia. *Steel*, v. 125, Dec. 12, 1949, p. 88-90, 120.

Procedures and equipment. Heliarc welding is used.

22B-439. Chrome Pipe Welding Improved by New Methods and Rigid-Shop Procedure. C. G. Herbruck. *Steel*, v. 125, Dec. 12, 1949, p. 94, 112.

Processing of pipe for steam and sour crude-oil usage.

22B-440. Engineered Backup Rings. *Industry and Welding*, v. 22, Dec. 1949, p. 17-19.

Proper procedure for use in welding of pipe.

22B-441. Resistance Welded Fasteners. R. A. Reich. *Industry and Welding*, v. 22, Dec. 1949, p. 27.

Small projections called "embossments" are used to localize current flow and heat at predetermined points during the welding operation.

22B-442. How To Weld Pipe With the Oxy-Acetylene Method. F. C. Geibig. *Industry and Welding*, v. 22, Dec. 1949, p. 28-30, 33, 48, 50-51.

22B-443. New Methods of Oxygen Cutting Stainless Steel. E. Seymour Semper. *Transactions of the Institute of Welding*, v. 12, Oct. 1949, p. 125-132.

The powder-cutting method, oxy-arc cutting, and flux-injection cutting. Apparatus and results. Micrographs show structures.

22B-444. An Evaluation of the Resistance Welding of Tin and Tin-Zinc Alloy Coated Mild Steel Sheet. A. J. Hipperson and P. M. Teanby. *Welding Research*, v. 3 (bound with *Transactions of the Institute of Welding*, v. 12), Oct. 1949, p. 86r-92r.

Applicability of spot and flash welding to coated sheet steel assemblies in production was investigated, especially modifications in technique compared with uncoated sheet. No difficulty was encountered in flash welding any of the coated steels, and properties of the joints were comparable with those obtained in uncoated sheet. Sn-Zn alloy coatings were found to be better suited to spot welding than plain tin coatings. The presence of Zn appeared to improve weldability considerably.

22B-445. Causes of Porosity in Welds. J. D. Fast. *Philips Technical Review*, v. 11, Oct. 1949, p. 101-110.

Attempts to develop a satisfactory explanation for the formation of porosity in electric-arc welding of steel, on the basis of experimental work and theoretical analysis. Lumps of iron were melted and allowed to solidify in vacuum and in various atmospheres. Porosity is believed to be largely due to gas entrapment. Differences in effects of different atmospheres and of gas-forming electrode coatings and metals. 13 ref.

22B-446. Beitrag zum Einfluss der Schneidwärme bei der Herstellung von Schweissproben aus St 52. (The Effect of Cutting Heat in the Preparation of Weld Specimens of St 52.) *Schweissen und Schneiden*, v. 1, Aug. 1949, p. 131-132.

Comparison of sawed and flame-cut specimens of St-52 steel shows that their respective tensile strength is the same, but that angle of bending (in bending tests) is smaller and notch-impact toughness of flame-cut specimens is greater than that of sawed specimens. Steels St-34, St-37, and St-42 were not affected.

22B-447. Multiarc Welding. (In Russian.) K. V. Zvegintseva. *Avtogennoe Delo* (Welding), July 1949, p. 1-4.

Method using two carbon electrodes and one metallic electrode is especially applicable to welding of sheet steel 0.5-1.0 mm. thick. Quality of weld seam and width of heat-affected zone compare favorably with and sometimes surpass those obtained by other methods.

22B-448. Investigation of Strength of Welded Construction Subject to Impact Stress. (In Russian.) G. I. Pogodin-Alekseev. *Avtogennoe Delo* (Welding), July 1949, p. 4-8.

Impact strength of I-beams, in which the webs are constructed of several sheets of metal. It was found that such sheets should not be welded continuously along their length, but across their ends and discontinuously along their length.

22B-449. The Problem of Practical Safety Factors in Welded Joints. (In Russian.) Ya. M. Likhtarinkov. *Avtogennoe Delo* (Welding), July 1949, p. 8-10.

Safety factors for steel developed as a result of practical experience and statistical analysis.

22B-450. Automatic Unidirectional Spot Welding of Steel. (In Russian.) F. E. Tret'yakov and G. I. Motin. *Avtogennoe Delo* (Welding), July 1949, p. 13-15.

Possibility of replacing manual arc welding of all-metal joint assemblies by automatic spot welding. Equipment, including electrical circuits. Operating conditions for different thicknesses of sheet.

22B-451. New Method for Thermit Welding of Rail Junctions in Trolley Tracks. (In Russian.) V. V. Lapskin and M. I. Login. *Avtogennoe Delo* (Welding), July 1949, p. 19-20.

Method is characterized by the fact that the molten thermit is applied inside a mold and does not touch the rail head. This method produces a very strong joint (able to withstand a static load of 45-60 tons).

22B-452. Automatic Welding of Storage Tanks at Low Temperatures. (In Russian.) A. S. Fal'kevich and V. S. Volodin. *Avtogennoe Delo* (Welding), July 1949, p. 21-24.

Applicability of automatic welding to storage tanks made from low-carbon steel sheets at low temperatures (down to —20° C.) was confirmed by investigation of mechanical and structural properties of welds, leak testing, and observations on crack formation.

22B-453. Semi-Automatic Welding Under Flux Using a Flexible Cable. (In Russian.) B. E. Paton, D. A. Dudko, and I. N. Rublevskii. *Avtogennoe Delo* (Welding), Aug. 1949, p. 6-9.

Electric welding using a special cable to connect the automatic welding machine to a manually operated electrode. Applicability in cases of short curved seams not easily accessible to the usual automatic devices. Influence of various factors, such as diameter of electrode, composition of flux, etc., and equations relating these factors to quality of the weld.

22B-454. General-Purpose Manual Apparatus for Welding Under Flux. (In Russian.) N. E. Nosemko. *Avtogennoe Delo* (Welding), Aug. 1949, p. 10-12.

Equipment, including electrical circuit and optimum operating conditions.

22B-455. Multilayer Automatic Welding Under Flux of Cylindrical Parts of "Cromansil" Steel. (In Russian.) Ya. A. Zav'yalov. *Avtogennoe Delo* (Welding), Aug. 1949, p. 13-14.

Suitability of the above process to circumferential welds on objects made from 30-mm. thick Cromansil steel. Both output and quality were greatly increased. Chemical composition and mechanical properties of the weld.

22B-456. Modern Water Main Construction. V. I. Laverty. *Canadian Metals and Metallurgical Industries*, v. 12, Nov. 1949, p. 18-19, 44.

Production of welded steel pipe for the water mains.

22B-457. The Functions and Uses of Hardfacing. J. J. Barry. *Steel Processing*, v. 35, Nov. 1949, p. 592-595.

Service conditions are divided into four broad groups and the hardfacing alloys used for each group summarized. Photomicrographs show structures of the different deposits. (To be continued.)

22B-458. Welded Pipe-Lines. Rolt Hammond. *Welding*, v. 17, Dec. 1949, p. 522-531.

Construction of pipelines in a number of different countries. Special equipment recently developed for this work.

22B-459. Manufacture of All-Welded Power Presses. *Welding*, v. 17, Dec. 1949, p. 532-538.

Procedures of Clearing Machine Corp., Chicago.

22B-460. Repair of Iron Castings: An Improved Type of Joint Design. G. G. Musted. *Welding*, v. 17, Dec. 1949, p. 539-543.

Special technique in which mild-steel tubing or sections are placed inside the joint or alongside the the fracture. In this way, necessity for preheating and slow cooling is avoided. Usually bronze welding is used to "tack" the pieces together. Ordinary welding is then done usually followed by peening while hot.

22B-461. Sugar Beet Equipment Penetration Welding Effects Big Economies. *Welding*, v. 17, Dec. 1949, p. 544-547.

Arc welding for construction of pressure cookers used in the sugar-beet industry.

22B-462. Fabrication of Large Alloy-Steel Shovel Buckets. E. R. McClung. *Welding Journal*, v. 28, Dec. 1949, p. 1133-1141.

Welding of high-yield-strength armor-type alloy steels for shovel buckets is a relatively new development. Fabrication problems.

22B-463. Silver Alloy Brazing Stainless Steel. C. H. Chatfield and A. W. Swift. *Welding Journal*, v. 28, Dec. 1949, p. 1142-1146.

Specific problems include cleaning and fluxing, carbide precipitation, types of stress cracking, corrosion resistance, and tensile strength of the joints.

22B-464. Economical Design of Welded Buildings. Robert E. Robertson. *Welding Journal*, v. 28, Dec. 1949, p. 1152-1161.

Emphasizes need for designing specifically for welding, instead of merely applying welding to a design made with riveting in view.

22B-465. Cutting Maintenance Costs With Aluminum-Bronze Electrodes. Joseph A. Cunningham. *Welding Journal*, v. 28, Dec. 1949, p. 1162-1165.

Use for overlaying worn parts and repairing broken parts.

22B-466. Welding Metallurgy—Iron and Steel. Chapter 4. Temperature Changes in Welding. O. H. Henry, G. E. Claussen, and G. E. Linnert. *Welding Journal*, v. 28, Dec. 1949, p. 1166-1171.

Reprinted from 2nd edition of book of above title (previously abstracted, 22B-217, 1949).

22B-467. Resistance Brazing of Heat Exchanger. G. C. Farrington. *Welding Journal*, v. 28, Dec. 1949, p. 1172.

Setup used and physical tests of the brazed assembly.

22B-468. Production Doubled With Elevating Positioner. *Welding Journal*, v. 28, Dec. 1949, p. 1174-1175.

By using a positioner mounted on a quick-acting elevator, a gland ring was welded, top and bottom, to a pump-liner shell without removing it from the positioner and without changing the level of the Unionmelt welding head.

22B-469. How To Do Steel Welding. C. H. Wanamaker. *Welding Journal*, v. 28, Dec. 1949, p. 1177-1180.

Recommended procedures for welding steel ⅛ in. or thicker.

22B-470. Influence of Consumption Rates on Flash Welding. W. N. Platte. *Welding Journal*, v. 28, Dec. 1949, p. 584s-598s.

Effect of material thickness, consumption rate, voltage current, and temperature. Optimum flashing schedules were established. Two sizes of low-carbon steel, hot-rolled bar stock were investigated.

22B-471. Tests of Specimens Simulating Weld Heat-Affected Zones. Ernest F. Nippes and Warren F. Savage. *Welding Journal*, v. 28, Dec. 1949, p. 599s-616s.

A time-temperature control device permits exact duplication of heating and cooling cycles by use of a cam. Using information obtained from previous studies of time-temperature relationships near an arc weld, suitable cams were made to duplicate several of the heat-affected structures associated with arc welds in ½-in. Al-killed steel plate. The device was used to produce specimens of each structure for impact testing. Results of Charpy-Izod tests.

22B-472. Steel Castings in Welded Assemblies. John Howe Hall. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 1-23.

Surveys literature on the use. Thermit welding and properties of weld metal and parent metal. 13 ref.

22B-473. Latest Applications of Heliarc Welding. R. H. Bennewitz and F. J. Pilia. *Automotive Industries*, v. 101, Dec. 15, 1949, p. 38-40, 60, 62.

See abstract from *Steel*, item 22B-438, 1949.

22B-474. Over gemengde lasrupsen. (Concerning Miscellaneous Weld Beads. Part I.) A. Ph. Krijff. *Smit Mededelingen*, v. 4, July-Sept. 1949, p. 65-71.

Results of Vickers hardness measurements and microstructure determinations for various types of welds in steel and at different locations in the weld.

22C—Nonferrous

22C-31. Joining Parts to Passivated Zinc Surface Accomplished Through Resistance Welding. *Materials & Methods*, v. 30, Nov. 1949, p. 73-74.

New, rapid spot welding method solved a difficult joining problem and permitted use of more economical finishing methods.

22C-32. Cold Welding Introduced Here. *Sheet Metal Worker*, v. 41, Nov. 1949, p. 35-36.

Welding process developed in England which requires no heat, electricity, or chemicals. Simple and inexpensive, it is believed that it will be widely used in nonferrous metals fabrication.

22C-33. Internal Sealing of Spark Plug Insulators. Karl Schwartzwalder and Carl F. Schaefer. *American Ceramic Society Bulletin*, v. 28, Nov. 15, 1949, p. 455-458.

Process for producing a hermetic seal within a ceramic spark-plug core insulator, between the halves of a two-piece electrode and the insulator. A mixture of glass and copper is compressed while in the hot plastic state.

22C-34. Solderability of Lead-Tin Alloy Plating. Lawrence H. Seabright. *Iron Age*, v. 164, Dec. 8, 1949, p. 93-96.

Various finishes for use as a preliminary coating in soldering of electrical equipment. Feasibility of Pb-Sn alloy plating and comparison of its solderability with that of hot-dip solder coating and pure-tin electroplating.

22C-35. Pressure Welding at Room Temperatures. *Product Engineering*, v. 20, Dec. 1949, p. 149.

New British process which has been successfully applied to Al, Cd, Cu, Ni, Zn, and Ag. It has now been licensed in the U. S. through Koldweld Corp., New York. Applications.

22C-36. Automatic Brazing Machine Triples Production. Fred Gandert. *American Machinist*, v. 93, Dec. 15, 1949, p. 90.

Heated by natural gas and using preformed silver-solder rings, turntable machine cuts assembly costs of electric water heaters.

22C-37. Soldering of Gas Apparatus With High-Phosphorus Copper Solder. (In Russian.) Z. M. Ryzhik. *Avtogennoe Delo* (Welding), July 1949, p. 26-27.

Chemical composition of solder, methods of production, and application. Experimental investigation shows that P content may be increased from the usual 6-8% to 12-14%. Use in soldering of brass gasburner tubes.

22C-38. Resistance Welding Reduces Weight of Fire Extinguishers. *Machinery* (American), v. 56, Dec. 1949, p. 164-165.

Silicon-bronze sheet is used for the cylinder.

22D—Light Metals

22D-74. New Flash-Welding Techniques. Chas. Bruno and G. W. Birdsall. *Welding Journal*, v. 28, Nov. 1949, p. 1070-1075.

Two new techniques for aluminum. First method somewhat resembles the Vang percussive welding process. Another variation is utilized to practically eliminate flash (excess metal) removal. The latter method is known as miter welding.

22D-75. Aircomatic Process Cuts Time. *Western Machinery and Steel World*, v. 40, Nov. 1949, p. 106, 110.

Use of new welding process in construction of special aluminum vessels.

22D-76. Le collage des alliages légers. (Bonding Light Alloys.) Pierre Prevot. *Revue de l'Aluminium*, v. 26, Sept. 1949, p. 297-307.

Principal adhesives used in France and abroad. This installment discusses Cycleweld (Chrysler Corp.); Desmodur and Desmophane (Germany); Metlbond (Consolidated Vultee Corp.); Plastilock (Goodrich); Reanit (General Tire and Rubber Co.); Redux (Aero Research, Ltd., and Resinous Products and Chemical Co.); and Araldite (Swiss). Various applications. 42 ref.

22D-77. Warping Eliminated With Heliarc. *Production Engineering & Management*, v. 24, Dec. 1949, p. 66.

Use of Heliarc welding in fabrication of aluminum fuel tanks.

22D-78. Welding Methods Decide Material. *Product Engineering*, v. 20, Dec. 1949, p. 107.

Adoption of Aircomatic semi-automatic welding made practical the use of aluminum for tanks for transportation of printing ink from factory to printing plant. Welding time was reduced from 280 to 48 hr.

22D-79. Welding of Aluminium Alloys: Value of Laboratory Tests. W. I. Pumphrey and D. C. Moore. *Transactions of the Institute of Welding*, v. 12, Oct. 1949, p. 116-124.

Results of laboratory tests for estimating the susceptibility of aluminum alloys to cracking. Test methods and typical results. 12 ref.

22D-80. Réparation des Carrosseries en alliages légers. (Repair of Light-Alloy Automobile Bodies.) Charles Guinard. *Revue de l'Aluminium*, v. 26, Oct. 1949, p. 332-338.

Practical welding and cold forming techniques developed for use on the Al-Mg alloy bodies of Dyna-Panhard automobiles.

22D-81. Manual Argon-Arc Welding of MA-1 Magnesium Alloy. (In Russian.) A. Ya. Brodskii and O. V. Meshkova. *Avtogennoe Delo* (Welding), July 1949, p. 10-12.

Results of experimental investigation (Mn content is 1.3-2.5%). Grain growth was observed in the intermediate zone. Recommended procedures.

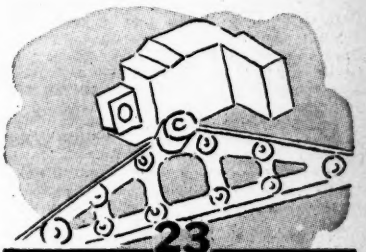
22D-82. Causes of Cracking During Welding of Aluminum Alloys. W. I. Pumphrey. *Welding*, v. 17, Dec. 1949, p. 548-552.

Results of investigation; special test apparatus. (To be concluded.)

22D-83. How Giant-Size Aluminum Trays Were Fabricated. *Welding Journal*, v. 28, Dec. 1949, p. 1173.

Hot-water trays, each 22 ft. long, 49.5 in. wide and 6 in. deep; also smaller albumin drying trays and laboratory trays were made to severe specifications. Welds were required to be smooth and free from all pinholes and irregularities.

For additional annotations indexed in other sections, see:
3B-277; 12-224; 16A-111; 19A-293; 19D-68; 20B-169-178; 22B-414; 23A-41; 24A-162-166-174; 24B-49



23 APPLICATIONS

23A—General

23A-38. How To Select Materials for Plastic Mold Cavities. L. J. Morrison. *Materials & Methods*, v. 30, Nov. 1949, p. 61-63.

Wide variety of mold materials now available and choice of the most economical one for a given application.

23A-39. Materials at Work. *Materials & Methods*, v. 30, Nov. 1949, p. 66-68.

Steel-tube TV antenna; corrosion resistant air valve; synthetic-fiber and wool filter; high-strength steel skids; magnesium gangplank; diaphragm-type fuel pump; and rubber "zipper" belts.

23A-40. Metal Containers in the Food Packing Industry. R. K. Sanders. *Research*, v. 2, Nov. 1949, p. 519-523.

Research on the above, confined to tin plate, black plate, Al, or Al alloys. Corrosion and leakage problems, the latter usually caused by defective soldered seams. 10 ref.

23A-41. Welded Fabrications in Corrosion Resistant Materials Give Engineers Great Latitude in Design of Industrial Equipment. R. J. Tierney. *Steel*, v. 125, Dec. 5, 1949, p. 92-93, 130.

A few examples of how corrosion resistant materials can be welded to cheaper metals in order to provide protection yet minimize over-all costs.

23A-42. Bimetallic Shears Have Replaceable Blades. *Product Engineering*, v. 20, Dec. 1949, p. 104.

The best properties of aluminum and steel are utilized in the design of pinking shears. The lightweight handles are of forged aluminum; but the actual cutting is done by a pair of cutlery steel inserts. All four pieces are held in place by a single hinge bolt.

23A-43. Metals Used in Clock and Instrument Manufacture. R. E. Trick-

er. *Engineering*, v. 168, Nov. 18, 1949, p. 543-546. A condensation.

Previously abstracted from *Journal of the Institute of Metals*. See item 23A-25, 1949.

23A-44. Wire Parts in Clocks and Instruments; Characteristics Described. *Wire Industry*, v. 16, Nov. 1949, p. 903, 905. Based on "Metals in Clocks and Instrument Manufacture", R. E. Tricker.

Previously abstracted from *Journal of the Institute of Metals*. See item 23A-25, 1949.

23A-45. High Corrosion Resistance Gives Nickel Plated Metals Wide Range of Uses. W. H. Prine. *Materials & Methods*, v. 30, Dec. 1949, p. 43-46.

Varied industrial applications where service conditions do not justify use of solid corrosion resistant materials.

23A-46. Materials at Work. *Materials & Methods*, v. 30, Dec. 1949, p. 64-66.

Al-finned radiator; plastic air precleaner; alloy pen nibs (Co-Ni-Cr-Mo-Mn-Fe-Be-C); plastic pharmaceutical trays; steel and rubber lathe collet for increased gripping power; multi-purpose garden tool, Mg grain shovels, and plastic textile-machine component.

23A-47. Weldable Stainless-Clad Copper Offers Material Economies in Many Applications. L. W. Townsend. *Steel*, v. 125, Dec. 19, 1949, p. 80-81, 104.

Combining heat conducting properties of copper with corrosion resistance and other qualities of stainless steel, new composite material has wide use in food and chemical processing, refrigeration, utensil, appliance, and aviation industries. Production methods and equipment.

23B—Ferrous

23B-62. Modern Boiler and Firebox Steel. *Railway Mechanical Engineer*, v. 123, Nov. 1949, p. 640-642.

Properties of different compositions, and effect of residual stresses on boiler failures.

23B-63. Aciers ferritiques pour turbines à gaz. Étude de l'acier HGT3 à 3% Cr-Mo-W-V. (Ferritic Steels for Gas Turbines. Study of HGT3 Cr-Mo-W-V Steel Containing 3% Cr.) (Concluded.) G. Wood and J. R. Rait. *Revue de Métallurgie*, v. 46, July 1949, p. 463-474; discussion, p. 474.

Production of the steel; optimum conditions of heat treatment; mechanical properties. Paths of future development of heat-resistant Cr steels containing different alloying elements are indicated.

23B-64. Stainless Tubing Cuts Cost of Cooker Fitting. *Product Engineering*, v. 20, Dec. 1949, p. 104.

Substitution of more expensive stainless steel tubing for stainless sheet lowered production costs on pressure-cooker handle because elimination of annealing operations, faster production, and fewer rejects more than offset increased cost of tubing.

23B-65. Beitrag zur Entwicklung und zum Stand der Temperguss-Transportketten. (The Development and Status of Malleable-Iron Conveyer Chains.) Franz Roll. *Die Neue Giesserei*, v. 36 (new ser., v. 2), Oct. 1949, p. 314-322.

Various types, their respective suitability and uses; methods of production; mechanical, chemical, and thermal wear; surface treatment; metallographic structures and defects; design; and tensile testing.

23C—Nonferrous

23C-71. A Survey of Dental Alloys. Joseph R. Lane. *Journal of the American Dental Association*, v. 39, Oct. 1949, p. 414-437.

Requirements for each of the alloys, and their compositions, and behavior. The field is divided into amalgams; precious-metal alloys; cobalt and chromium alloys; stainless steels; and other metals for dentures. Table gives compositions of representative commercial amalgam alloys. Includes constitution diagrams. 65 ref.

23C-72. Cutting Costs With Beryllium Copper Molds. Richard A. Burkett and John T. Richards. *Modern Plastics*, v. 27, Dec. 1949, p. 99-101, 104, 106.

Mold-production methods from sand, pressure, or investment casting to heat treating, machining, and polishing. Welding, soldering, and plating are also sometimes used. Chromium-plated contact surfaces are necessary to prevent corrosion from phenolics or vinyls.

23C-73. Zirconium Electrodes Heart of New Arc Lamp. *Product Engineering*, v. 20, Dec. 1949, p. 148.

23C-74. Zirconium Widens Its Industrial Orbit. Warren B. Blumenthal. *Chemical Industries*, v. 65, Nov. 1949, p. 728-730.

History, production, and metallic and nonmetallic uses. 14 ref.

23C-75. Springs: the Applications of Nickel Alloy Materials. *Metal Industry*, v. 75, Nov. 25, 1949, p. 451-454.

Mechanical properties of the different commercial Ni alloys. Applications, temperature effects, and manufacturing methods.

23C-76. Small Fasteners. *Die Castings*, v. 7, Dec. 1949, p. 18-20.

Produced generally from Zn alloy. It is said that production is more economical than by screw machining, forging, cold heading, or wire-forming processes.

23C-77. Inserts and Special Fasteners for Adjustable Lamps. *Die Castings*, v. 7, Dec. 1949, p. 22-23, 25.

Production from Zn die castings.

23C-78. Dependable Driving and Braking Mechanism Built With Die Castings. *Die Castings*, v. 7, Dec. 1949, p. 28-31, 54.

Used in wire recorders. Several parts are Zn-base die castings.

23C-79. New Uses for Cobalt-Base Spring Alloy. Roger F. Waindle. *Metal Progress*, v. 56, Dec. 1949, p. 808-811.

Mechanical and corrosion-resistant properties of "Elgiloy"—developed for use in watch mainsprings. Nominal composition: 40% Co, 20% Cr, 15% Ni, 7% Mo, 2.0% Mn, 0.04% Be, 0.15% C, balance Fe. Applicability for a variety of commercial uses.

23D—Light Metals

23D-128. Aluminium Busbars; Wider Use of Light Metal Conductors in the Electrical Industry. John Boyne. *Engineering & Chemical Digest*, v. 1, Sept. 1949, p. 97-99.

Condensed from *British Engineer*, v. 8, no. 3.

23D-129. Drawn and Extruded Aluminum Products in Relation to the Electrical Industry. H. V. Menking. *Electrical Engineering*, v. 68, Dec. 1949, p. 1094. A condensation.

Properties and applications.

23D-130. Aluminum Panels for Modern Ceiling Design. *Modern Metals*, v. 5, Nov. 1949, p. 15.

All-metal acoustical ceiling.

23D-131. Army Buys Air-Borne Aluminum Boats. *Modern Metals*, v. 5, Nov. 1949, p. 20.

23D-132. Aluminum Door Frames Added to Pittco Store Front Products. *Modern Metals*, v. 5, Nov. 1949, p. 22-23.

23D-133. Light Alloy in the Petroleum Industry. (Concluded.) *Light Metals*, v. 12, Oct. 1949, p. 542-550; Nov. 1949, p. 633-640.

Oct. installment: Al paint and use of Al foil for storage tanks. Importance of Al in storage-tank construction. Final installment: Mg tank trucks, Al railway tank cars, Al hoses, Mg alloy pipes, Al gasoline cans, and uses of Mg in the oil field and for cathodic protection. 62 ref.

23D-134. New Roof for Old. *Light Metals*, v. 12, Nov. 1949, p. 597-599.

Installation of new aluminum alloy roof.

23D-135. Duralumin in Structural Work. *Light Metals*, v. 12, Nov. 1949, p. 610-612.

23D-136. Aluminium for Electrical Conductors. András Domony. *Light Metals*, v. 12, Nov. 1949, p. 614-628. Translated from *Aluminium* (Hungary), no. 1, 1949, p. 159.

Relationship between the metallurgical and electrical properties of Al and certain Al alloys. Production procedure for metal at the smelter and for conductor wire; current lines of research toward improving materials at present available for such wire.

23D-137. Conception et construction de la Dyna-Panhard. (Design and Construction of the Dyna-Panhard.) Maurice Victor and Jean Blanchot. *Revue de l'Aluminium*, v. 26, Sept. 1949, p. 287-296.

The Dyna-Panhard is said to be the first automobile to be built on a mass-production basis with body and numerous other parts of light metals.

23D-138. La rame en alliages légers de la C.I.M.T. (Light-Alloy Rolling Stock of the C.I.M.T.) Maurice Victor. *Revue de l'Aluminium*, v. 26, July-Aug. 1949, p. 239-255.

Design and construction of French railway passenger cars which use a high proportion of light alloys and special pneumatic tires which ride on the rails. Numerous diagrams and illustrations.

23D-139. Electric Fuses in Aluminium Wire. *Wire Industry*, v. 16, Nov. 1949, p. 906.

Superior results obtained.

23D-140. Conception et construction de la Dyna-Panhard. II. La carrosserie. (Design and Construction of the Dyna-Panhard. II. The Body.) Maurice Victor. *Revue de l'Aluminium*, v. 26, Oct. 1949, p. 320-331.

Body of French automobile is entirely of light metal. Details of construction and over-all appearance. Performance data.

23D-141. Les piles électriques au Magnésium. (Use of Magnesium in Batteries.) Bernard Raclot. *Revue de l'Aluminium*, v. 26, Oct. 1949, p. 343-345.

Characteristics of batteries having Mg cathodes. Such batteries produce triple the current and 2½ times the voltage of those using Zn cathodes. Three types are the Gordon or "water" battery; the Burgess and Dow, which uses an acid solution; and a type using a saline electrolyte.

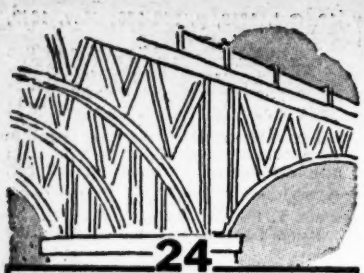
23D-142. Design of a Portable Saw. *Die Castings*, v. 7, Dec. 1949, p. 32-34, 55-56.

Utilizes Al-alloy die castings for many parts.

23D-143. Aluminum Used Successfully in Precision Instruments. *Materials & Methods*, v. 30, Dec. 1949, p. 50-52.

Varied uses and miscellaneous fabrication operations.

For additional annotations indexed in other sections, see:
3B-280-281-290-292; 5C-29; 14D-68; 20A-537; 22B-412; 24D-28; 25C-75-76



24 DESIGN

24A—General

24A-149. The Distribution of Load in Screw Threads. D. G. Sopwith. *Institution of Mechanical Engineers, Proceedings*, v. 159, War Emergency Issue No. 45, p. 373-383; discussion, p. 391-398.

Strains are analyzed and load distribution along the thread helix deduced. Possible methods of improving load distribution and effect of yielding. Experimental confirmation of some of the results is included.

24A-150. Tensile Fillet Stresses in Loaded Projections. R. B. Heywood. *Institution of Mechanical Engineers, Proceedings*, v. 159, War Emergency Issue No. 45, 1948, p. 384-391; discussion, p. 391-398.

Existing fillet-stress formulas give accurate results over only a narrow range of projection shapes. An empirical formula is advanced which agrees well with experiment over a wide range of projection shapes, and which provides a powerful method of determining the strongest shape of projection for any given purpose. The procedure is demonstrated for a series of screw-thread forms.

24A-151. Critical Shear Stress of a Curved Rectangular Panel With a Central Stiffener. Manuel Stein and David J. Yaeger. *National Advisory Committee for Aeronautics*, Technical Note 1972, Oct. 1949, 19 pages.

A theoretical solution is given for the above, having no torsional restraint in either the axial or circumferential direction. Results were obtained by the Galerkin method.

24A-152. Plastic Distortion of Non-Uniform Sheets. R. Hill. *Philosophical Magazine*, ser. 7, v. 40, Oct. 1949, p. 971-983.

A mathematical analysis.

24A-153. Aluminum-Iron Drum Boosts Vehicle Brake Performance. *SAE Journal*, v. 57, Nov. 1949, p. 56-61. Based on paper "Design and Development Considerations of a Bimetallic Brake Drum" by Charles E. Stevens, Jr. (To be printed in full in *SAE Quarterly Transactions.*)

Advantage is due to efficient dissipation of frictional heat, thus minimizing lining failures. After developing a design that combined good heat transfer with ability of the bond to withstand thermal stresses, the drums were tested on a dynamometer, then in a midget racing car, finally in a medium-sized bus.

24A-154. Bimetal Brake Drums; A Study of the Heat Stresses in Thin Cylinders. G. A. G. Fazekas. *Automobile Engineer*, v. 39, Oct. 1949, p. 394-396.

Derivation and graphical representation of design formulas. Application to an example in which an Al alloy sheet is bonded to a cast iron liner.

24A-155. Critical Stress of Ring-Stiffened Cylinders in Torsion. Manuel Stein, J. Lyell Sanders, Jr., and Harold Crate. *National Advisory Committee for Aeronautics*, Technical Note 1981, Nov. 1949, 17 pages.

A nondimensional chart is presented for the theoretical critical stress in torsion of simply supported cylinders stiffened by identical, equally spaced, torsionally weak rings. Results are obtained by solving the equation of equilibrium by the Galerkin method. Comparison of theoretical with experimental results indicates that ring-stiffened cylinders buckle, on the average, at a stress about 15% below the theoretical buckling stress.

24A-156. Mechanics of Elastic-Ductile-Plastic Bodies. III. Torsion in Cylinders. (In Russian.) A. I. Gubanov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, July 1949, p. 773-781.

A mathematical analysis. Formulas are proposed for determination of torsion at a given angle of torque and are interpreted for different values of variables. Possibility of application of the equations to other torsion problems.

24A-157. (Book) Analytical Mechanics of Gears. Earle Buckingham. 546 pages. 1949. McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y. $10.00.

Conjugate gear-tooth action, nature of contact, and resulting gear-tooth profiles. Closing chapters analyze gear teeth in action. Discussions include frictional heat of operation and its dissipation, friction losses and efficiencies, dynamic loads in operation, beam strength or resistance of teeth to breakage and fatigue, surface-endurance limits of materials, and limiting wear loads or potential resistance to surface disintegration and excessive wear.

24A-158. Eleven Ways To Use Die Springs. J. R. Paquin. *American Machinist*, v. 93, Dec. 1, 1949, p. 108-110.

How to avoid trouble in common applications, and to devise correct solutions for unusual problems in forming-die design.

24A-159. Check List for Die Designers. E. Rausch. *American Machinist*, v. 93, Dec. 1, 1949, p. 110.

Refers to forming-die design.

24A-160. Tools of Design. William H. Browne. *Metals Review*, v. 22, Nov. 1949, p. 4-6.

Recent developments in design techniques, materials, testing techniques, and production procedures. (References to "A.S.M. Review of Current Metal Literature".)

24A-161. How Plastic Deformation Influences Design and Forming of Metal Parts. Part 1. True Stress-Strain and Initial Plastic Flow. Part 2. Plastic Flow and Rupture of Metals. John R. Low, Jr. *Materials & Methods*, v. 30, Nov. 1949, p. 47-51; Dec. 1949, p. 59-63.

Simple explanation of plastic flow in metals and how application of present knowledge on the subject can be used to advantage in the design and production of metal products.

24A-162. The Design and Fabrication of Welded Structures Subjected to Repeated Loading. Part III. R. Weck. *Welder*, v. 18, July-Sept. 1949, p. 61-66.

Effect of notches on fatigue strength; and influence of the stress gradient. Summarizes basic facts on the fatigue of metals.

24A-163. The Icosasphere, A New Spherical Tank Layout. J. O. Jackson. *Iron Age*, v. 164, Nov. 17, 1949, p. 92-94.

Method of designing and building welded spherical tanks and other double-curved plate surfaces which gives reduction in scrap loss and welded footage.

24A-164. Design Considerations for Manufacturing Economy. Roger W. Bolz. *Mechanical Engineering*, v. 71, Dec. 1949, p. 1004-1010.

Possibilities of achievement of large savings by redesign and change of process.

24A-165. Maximum Design Load vs. Temperature for Springs. O. G. Meyers. *Product Engineering*, v. 20, Dec. 1949, p. 161.

Curves for six common spring alloys.

24A-166. Basic Rules Govern Welding Fixture Design. *American Machinist*, v. 93, Dec. 15, 1949, p. 82-85.

Thirteen rules to observe followed by practical examples.

24A-167. Relation of Experiments to Mathematical Theories of Plasticity. D. C. Drucker. *Journal of Applied Mechanics*, v. 16 (*Transactions of the American Society of Mechanical Engineers*, v. 71), Dec. 1949, p. 349-357.

Several classes of mathematical theories of plasticity for work hardening materials are surveyed for their advantages, disadvantages, and agreement with experiment. Proper correlation of tests on thin-walled tubes subjected to tension, torsion, and internal pressure in fixed but arbitrary ratio. The concept of isotropic work hardening, assumed in practically all stress-strain relations. 17 ref.

24A-168. Safety Factors in Screw Thread Assemblies. Howard L. Hopkins. *Fasteners*, v. 6, no. 2, 1949, p. 13-16.

Tensile-test results indicate that large safety factors exist. Because of this fact, small fastener defects have no appreciable effect on stress characteristics of the assembly. Effects of the change from American standard to unified threads were also found to be insignificant.

24A-169. Designing Metal Parts for High Temperature Service. F. G. Sefing. *Canadian Metals and Metallurgical Industries*, v. 12, Nov. 1949, p. 14-17, 36.

Various factors involved, giving specific examples and mechanical properties of common metals and alloys. 16 ref.

24A-170. Metallic Noise. D. H. Lloyd. *Metal Industry*, v. 75, Oct. 28, 1949, p. 371-375; Nov. 4, 1949, p. 391-393; Nov. 11, 1949, p. 419-421; Nov. 18, 1949, p. 436-438, 444; Nov. 25, 1949, p. 455-457, 461; Dec. 2, 1949, p. 479-481.

Fundamental principles responsible for the production of noise by metallic objects and structures. Also describes principles of damping, which, it is said, may be applied to design of noise-free metallic products such as car bodies, cabinets, sinks, refrigerators, washing machines, ash-trays, utensils, etc. Methods of application of coatings having damping properties.

24A-171. Stresses in Hot Metal Ladles. K. E. Knudsen, Wm. H. Munse, and B. G. Johnston. *Iron and Steel Engineer*, v. 26, Dec. 1949, p. 46-49; discussion, p. 69-70.

Extensive experimental and theoretical study using three 1/5-scale models of 150-ton prototypes. Mercury was used as the loading agent in most cases and strains were measured by resistance strain gages. Deflections were measured by dial gages. 14 ref.

24A-172. Fabricated Materials and Parts—a Comparison of Their Design and Production Factors. *Materials & Methods*, v. 30, Dec. 1949, p. 67-82.

Design, cost, and production features of small fabricated forms, and processes involved in their manufacture. Emphasis is on final form in which the various materials are to be used, rather than on processes of manufacture.

24A-173. Design of Fixture Elements, Clamps and Fixture Components. Hans W. Smith. *Tool Engineer*, v. 23, Dec. 1949, p. 34-37.

24A-174. Tank Plate Layout Method Materially Reduces Scrap Loss and Welding Time. *Steel*, v. 125, Dec. 19, 1949, p. 100, 103.

New method of predicting flow or displacement of materials in plates and sheets which are bent, formed, or drawn in such a manner that plastic flow occurs. Method is applicable to construction of spherical tanks and other double-curved plate surfaces.

24A-175. Leistungssteigerung an hochbelasteten Zahnrädern; Ein Beitrag zur Frage der Zahngestaltung. (Increasing the Efficiency of Highly Stressed Gear Wheels; a Contribution to the Problem of Tooth Design.) Heinz M. Hiersig. *Stahl und Eisen*, v. 69, Sept. 29, 1949, p. 695-701.

A type of tooth which permits large profile displacements without varying the original center distance. Efficiency compared with that of other types. 17 ref.

24A-176. (Book) Machinery's Handbook. Ed. 14. 1911 pages. 1949. Industrial Press, 148 Lafayette St., New York 13, N. Y. $7.00.

Basic information, data and formulas for use in designing or building any type of machine or other mechanical device. Contains the unified and American Standard Screw Thread System. Revised sections on broach design, electric motors, worm gearing, roller chains, standard iron and steel compositions and applications, carbide tools, grinding wheels and abrasives.

24A-177. (Book) Strength of Materials. Gerner I. Olsen. 442 pages. 1949. Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. $4.25.

Material is presented simply and directly, requiring no more mathematics than algebra. Emphasizes practical use of the material. Principles of mechanics and fundamental stress and strain relationships. Chapters on thin-walled cylinders and spheres and riveted and welded joints, torsion, shear and bending moment diagrams, design and deflection of beams, statically indeterminate beams, stresses due to eccentrically applied loads, columns, combined stresses, and fatigue strength and stress concentrations.

24B—Ferrous

24B-46. Steel Columns. A Survey and Appraisal of Past Works. A. A. Jakkula and Henson K. Stephenson. *Bulletin of the Agricultural and Mechanical College of Texas*, ser. 5, v. 3, June 1, 1947 (Texas Engineering Experiment Station, Bulletin No. 91), 118 pages.

A bibliography of previous analytical and experimental works. Summarizes important tests, design procedures, and correlation between test results and the secant formula. 280 ref.

24B-47. (Book) Theory of Modern Steel Structures. Vol. 1. Statically Determinate Structures. Rev. Ed. Linton E. Grinter. 341 pages. 1949. Macmillan Co., 60 Fifth Ave., New York 11, N. Y.

Textbook for undergraduate courses considers basic problems of stress analysis by relating them to specific types of structures. Includes analysis of trusses which is divorced from the structure itself. Some design information concerning loadings and planning of the structure is integrated into each chapter in order to relate the subject of analysis to structural engineering. Footnote references.

24B-48. Perforated Cover Plates Improve Strength of Structural Steel Columns. *Steel*, v. 125, Nov. 28, 1949, p. 90, 92.

Results of tests at National Bureau of Standards in cooperation with American Institute of Steel Construction.

24B-49. Arc-Welded Beam and Column Framing. (Continued.) *Welding Journal*, v. 28, Nov. 1949, p. 1087-1088.

Design details.

24B-50. Effect of Buckles on Strength in Welded Ships. P. H. Take. *Welding Journal*, v. 28, Dec. 1949, p. 569s-574s.

A cooling-water ring-shaped spray encircling the burner tip was provided to produce severe buckling. It was found that, under certain conditions of restraint, buckles in plate section reduce the strength of plate sections and may act as notches. Under other conditions, where equalization of stress under load is possible, they may be harmless.

24B-51. (Book) Elementary Structural Problems in Steel and Timber. Ed. 3. C. R. Young and C. F. Morrison. 312 pages. 1949. John Wiley and Sons, 440 4th Ave., New York 16, N. Y. $4.50.

Presents a number of worked examples as a guide to students and junior structural designers in the application of structural theory to practical design problems. The section on steel construction has not been changed much from that in the second edition. It covers tension and compression members and their details; beams, box girders, and plate girders; steel trusses, cranes, and crane supports; moving loads on beams, trusses, and girders; and design of a 50-ft. span highway bridge.

24D—Light Metals

24D-25. Les boites convolute et Z résultat de l'alliance du carton et de l'Aluminium. (Convolute and "Z" Type Boxes Made of Cardboard and Aluminum.) Claude Patin. *Revue de l'Aluminium*, v. 26, July-Aug. 1949, p. 259-261.

New types of containers composed of cardboard tubular bodies with aluminum lining, also metallic bottoms and lids. Several systems for attaching the lid: crimped, friction-type, slip-on, convolute, or Z-section.

24D-26. Chromium Plated Cylinders Increase Capacity of Lightweight Engines. A. W. Mall. *Iron Age*, v. 164, Dec. 1, 1949, p. 86-90.

How a portable engine was redesigned to take advantage of porous chromium plating of aluminum cylinder walls. Size, weight, and cost were reduced about 30% and rating of the unit increased 32%. Factors influencing the new design and various steps in processing the cylinders.

24D-27. Stability of Alclad Plates. Kenneth P. Buchert. *National Advisory Committee for Aeronautics*, Technical Note 1986, Dec. 1949, 33 pages.

On the basis of plasticity theory, a theoretical solution for buckling was developed. The differential equation of equilibrium and the energy expression are derived. Results are presented for the buckling of long simply supported plates under longitudinal compression and under shear, and for a plate-column. Theoretical and experimental results are compared.

24D-28. Étude d'un outillage métallique; Une coquille pour filtre à air en alliage d'Aluminium. (Study of Metallic Equipment; an Aluminum-Alloy Air-Filter Housing.) Jean Duport. *Fonderie*, Sept. 1949, p. 1740-1743.

Design details of equipment.

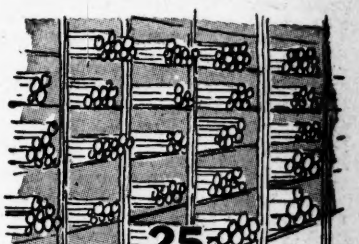
24D-29. Design of Light Metal Castings. Responsibilities of Metal Producers, Foundries, and Designers. George H. Found. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 409-413; discussion, p. 413-414.

Previously abstracted from *American Foundryman*, item 24D-5, 1949.

24D-30. Magnesium Castings Designed for Aircraft Engines. M. H. Young and A. G. Slachta. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 378-382; discussion, p. 382-383.

Previously abstracted from *American Foundryman*, item 24D-2, 1949.

For additional annotations indexed in other sections, see: 3B-270; 14C-101-102; 19A-282; 20A-494; 22A-262; 22B-448-464



MISCELLANEOUS

25A—General

25A-159. Research Organizations Serve All Industry. Benjamin Melnitsky. *Industry and Power*, v. 57, Nov. 1949, p. 100-102.

Research institutions, their function, scope, and methods of payment. Specific information on Armour, Battelle, Mellon, Midwest, and Southern.

25A-160. Government Wants To Help Mining Industry; Has No Desire To Control Mineral Output. James Boyd. *Metals*, v. 20, Oct. 1949, p. 6-7, 10.

Administration's position with respect to subsidy and incentive legislation; problems facing industry.

25A-161. Status of Strategic Metals. James P. Bradley. *Metals*, v. 20, Oct. 1949, p. 9-10.

Domestic strategic metal mines are high-cost producers; need high tariff protection against foreign producers and cartels.

25A-162. Selected List of References on Minerals and Related Subjects. D. G. Runner. *U. S. Bureau of Mines*, Information Circular No. 7521, Sept. 1949, 9 pages.

Lists books most commonly used and most generally available under the following headings: minerals, gems, rocks, geology, geomorphology, engineering geology, prospecting, mining engineering, microscopy, technical dictionaries, and miscellaneous.

25A-163. Suggested International Metallurgical Association. R. Seligman. *Engineering*, v. 168, Oct. 21, 1949, p. 415-416. A condensation.

Possible activities and advantages to be gained by formation of above.

25A-164. (Book) Engineering Materials and Processes: Metals and Plastics. Ed. 2. William Howard Clapp and Donald Sherman Clark. 526 pages. International Textbook Co., Scranton 9, Pa. $6.50.

Content is essentially the same as that of the first edition and presents a brief treatment of the physical properties, processing, and uses of the principal engineering materials. Chapters on cooling curves and equilibrium diagrams, plastics, castings,

and methods of joining metals have undergone the greatest change.

25A-165. (Book) Sixth Semiannual Report of the Atomic Energy Commission. 203 pages. 1949. U. S. Government Printing Office, Washington, D. C.

Reviews major developments in atomic energy programs. Considers the field of biology and medicine, particle accelerators, research in metals, accounting for materials, and finance.

25A-166. Metals in Relation to Living Standards in Industrially Under-Developed Countries. D. N. Wadia. *Journal of Scientific & Industrial Research*, v. 8, Oct. 1949, p. 389-394.

The growing depletion of the world's metallic mineral resources and trends in their use. Tendency toward increasing use of metals by countries which have heretofore been mainly suppliers. Metallic-mineral resources of the Far East and India. Estimates of requirements for industrial and agricultural development.

25A-167. Cyanide Hazards. Robert H. Duguid and Wesley C. Cox. *Metal Progress*, v. 56, Dec. 1949, p. 814-815.

Hazards, recommended precautions, symptoms, and treatments.

25A-168. The Fume and Dust Problem in Industry. Harry V. Welch. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 185), p. 934-947.

Losses and/or values in suspended solids; particle size; dust and fumes in community and individual living; means and procedures for dust and fume collection; and equipment types used for dust and fume collection. 22 ref.

25A-169. (Book) Metals Reference Book. C. J. Smithells, editor. 735 pages. 1949. Interscience Publishers, Inc., 215 Fourth Ave., New York 3, N. Y. $13.00. Also Butterworths Scientific Publications, Ltd., 4-6 Bell Yard, Temple Bar, London, W.C. 2, England. 60s.

Essentially a book of data. Descriptive matter is in general extremely short. Extractive and forming processes, with the exception of casting, are omitted; but data on joining processes are provided. Fundamental properties and also the lesser known properties.

25A-170. (Book) Alloy Steels, Cast Iron and Non-Ferrous Metals. F. Johnson. 227 pages. 1949. Chemical Publishing Co., 26 Court St., Brooklyn 2, N. Y. $5.00.

General aspects of production processes and their relation to properties. Physical, chemical, and mechanical properties, as well as applications.

25A-171. (Book) Chemical Constitution and Properties of Engineering Materials. P. C. Carman. 894 pages. 1949. Edward Arnold & Co., London, England.

Metals and metallic corrosion, inorganic materials, organic materials, and service materials. The latter includes fuels and water. Discusses corrosion, heat treatment, tests, etc. Chapter bibliographies.

25B—Ferrous

25B-55. Trends in Iron and Steel Forgings—Castings. A. B. Tietjen. *Western Machinery and Steel World*, v. 40, Nov. 1949, p. 96-97.

Economic trends from the Western U. S. viewpoint.

25B-56. Research in the French Iron and Steel Industry. *Metal Treatment and Drop Forging*, v. 16, Autumn 1949, p. 164-170.

French research organizations and personalities. Résumés of papers presented at a recent meeting in Paris of Société Française de Métallurgie.

25B-57. Metallurgical and Property Relationships in Stainless Steels. Samuel J. Rosenberg. *Product Engineering*, v. 20, Dec. 1949, p. 81-86.

First of two articles giving a basic review of the metallurgy of stainless steels, relating fundamental considerations to heat treatment, properties, fabrication methods and uses.

25B-58. Science; Application to the Products of the Steel Industry. W. Barr. *Iron and Steel*, v. 22, Nov. 22, 1949, p. 519-524.

Examples of the development of new and better products include improvement of notch ductility of mild steel for shipbuilding and structural work; evolution of weldable high-tensile steels; steels for high-temperature service; and stainless-clad steels. Method of making the latter, and effects of composition, structure and heat treatment on mechanical properties.

25B-59. (Book) Republic Alloy Steels. 383 pages. 1949. Republic Steel Corp., Republic Bldg., Cleveland.

Hardenability, properties, heat treating, transformation, testing procedures, and applications. Chapter bibliographies.

25C—Nonferrous

25C-72. Program for Mining Industry. Elmer W. Pehrson. *Metals*, v. 20, Nov. 1949, p. 6-7, 9-10.

Recommends sound tariff structure to provide better incentives and larger stockpile goals for peacetime security.

25C-73. Sees Bright Outlook for Copper Market and Continuation of Tight Supply Situation. Joseph Zimmerman. *Metals*, v. 20, Nov. 1949, p. 11-12, 14.

25C-74. Bronzes de Aluminio. (Aluminum Bronzes.) Livio Euler de Araujo. *Boletim da Associaçao Brasileira de Metais*, v. 5, July 1949, p. 313-323.

A study of commercial Al bronzes. Influences of chemical composition, alloying elements, and heat treatment on mechanical properties and structures.

25C-75. Which Copper-Base Alloy? R. Carson Dalzell and Joseph J. Matt. *Machine Design*, v. 21, Dec. 1949, p. 125-134.

Mechanical, physical and working properties and applications of the various types.

25C-76. Les Cupro-Siliciums moulés. (Copper-Silicon Castings.) Georges Blanc. *Fonderie*, Oct. 1949, p. 1783-1789.

Review of the literature, covering physical and mechanical properties; foundry practice; applications; and French, British, and U. S. standards. 11 ref.

25D—Light Metals

25D-39. Wrought Magnesium Alloys; Typical Properties. *Materials & Methods*, v. 30, Nov. 1949, p. 75.

Table gives compositions; physical, mechanical, and fabricating properties; corrosion resistance; thermal treatment; available forms; and applications.

25D-40. Magnesium's Position in the Metal Field. J. W. Meier. *Modern Metals*, v. 5, Nov. 1949, p. 16-18.

Comparative tables showing world production, prices, and physical properties of "basic" metals. Includes graphs of mechanical properties of some wrought and sand-cast alloys.

25D-41. Availability of Magnesium. *Magazine of Magnesium*, Nov. 1949, p. 2-5.

Economic survey.

25D-42. The Canadian Aluminum Industry. P. E. Radley. *Canadian Chemistry and Process Industries*, v. 33, Nov. 1949, p. 952-955.

Brief over-all description.

25D-43. (Book) The Light Metals Industry. Winifred Lewis. 397 pages. 1949. Temple Press, Ltd., Bowling Green Lane, London, E.C. 1, England. 21s.

A study of the technological and economic development of the light-metals industry.

For additional annotations indexed in other sections, see: 2B-339

Four Problems Involved In Metallurgical Aspects Of Nuclear Reactors

Reported by C. W. McKee

Test Engineer, Midvale Co.

The efficient production of fissionable materials is an important factor in the security of our nation, John P. Howe told the Philadelphia Chapter A.S.M. in his talk on "Research Problems in Materials for Nuclear Reactors". Dr. Howe has worked for Manhattan Engineering Project at both Chicago and Hanford, and is now the head of the division of metallurgy of the Knolls Atomic Power Laboratory of the General Electric Co. This laboratory is operated under a contract with the Atomic Energy Commission.

These materials can be produced with the release of vast quantities of energy and possibly in such a way as to tap an energy source that may turn out to be of the same order of magnitude as coal. The nature of nuclear fuels makes the investigation of their application to certain special power plants imperative.

The work toward efficient nuclear reactors may be thought of in terms of some eight central problems, four of which are of paramount importance to metallurgists. These are:

1. Removal of heat from nuclear reactions.

2. Obtaining a favorable balance in the "neutron economy" in the nuclear transformations in a reactor.

3. Designing stable reactor components.

4. Fabrication of the components.

In addition to the fissionable and fertile materials, uranium, thorium, and plutonium, several other rather unfamiliar materials must receive attention from the metallurgist. The physical metallurgical work on some of these materials was discussed under the main headings of structure, properties, and reactions. The status of this work was illustrated by a brief discussion of beryllium, uranium, and graphite. The basic metallurgy covers familiar topics, Dr. Howe pointed out, but is given a new aspect by the conditions in the reactor.

Speaks on Grinding Abuses

Reported by H. A. McMahon

Chief Inspector, Struthers-Wells Corp.

"Some Important Factors in Grinding Hardened Steel"were presented before the Northwestern Pennsylvania Chapter A.S.M. on Nov. 17 in Meadville, Pa. The speaker was Carl O. Lundberg of Norton Co.

His address was accompanied by a number of slide projections showing the results of different types of abuses in grinding. Mr. Lundberg explained the procedure necessary to prevent these abuses, and gave a clear and concise description of the grinding process, its merits and limitations.

LaPelle With Westinghouse

R. R. LaPelle, a member of the executive committee of the Springfield Chapter A.S.M., has resigned as vice-president of the Dempsey Industrial Furnace Corp., and is now associated with Westinghouse Electric Corp. He will act as industrial heating specialist in New England and New York, with office in Springfield, Mass.

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

POSITIONS OPEN

East

STEEL SALES REPRESENTATIVE: For New England territory. Must be experienced in sales and service of high-grade tool and specialty steels. Knowledge of steel metallurgy essential. Write qualifications. Box 1-5.

RESEARCH DIRECTOR: Chemical products for metal and textile industries. 35 to 40 years of age, with Ph.D. degree in organic or physical chemistry. Prefer man with experience in metal and textile industries. Box 1-10.

METALLURGIST: Excellent research opportunity for metallurgist or similarly qualified engineer capable of and interested in research in welding metallurgy. Prompt, confidential handling of applications. Address Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio.

SALES MANAGER: Hard hitting, hard working result getter wanted. Experience in industrial sales to metalworking plants essential. Technical training desirable. Location, Chicago. Substantial salary plus commission. Box 1-15.

WORKS MANAGER: For well-known company in publishing field. Must have successful record of management, coming up through production in a job shop operation; experience in publishing field not required. Will be responsible for production, purchasing, finance and sales. Starting salary of $18,000 to $20,000. Box 1-130.

WELDING RESEARCH CHEMIST: Eutectic Welding Alloys Corp., manufacturer of welding rods and electrodes, is creating a new position with unlimited scope for a research and development chemist. Candidate must have solid background in all phases of oxy-acetylene and arc welding, both ferrous and nonferrous. The company is prepared to put considerable resources behind this position. It offers expanding research facilities, as well as an atmosphere of congeniality, to induce top creative work. Location Flushing, Long Island, 20 minutes from New York City. Kindly submit complete transcript of curricular work and subsequent employment. Applications treated in strictest confidence. Write Rene D. Wasserman, president, Eutectic Welding Alloys Corp., 40 Worth St., New York 13.

Midwest

METALLURGIST: Or similarly qualified engineer, capable of, and interested in, welding metallurgy. Excellent research opportunity. Prompt, confidential handling of applications. Address replies to Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio.

POSITIONS WANTED

METALLURGIST: Age 27, family. Desires connection in sales, trouble shooting, customer contact work, preferably in Philadelphia area. Five to six years' experience in laboratory work and heat treatment. Box 1-20.

METALLURGIST: B.S. Ch.E., University of Wisconsin. Age 34, married, two children. Nine years' experience in welding, heat treating, physical testing, statistical quality control, plating, corrosion, trouble shooting and metallography. Desires responsible position with a medium-sized plant. Location open. Box 1-25.

REGISTERED ENGINEER: B.S. in metallurgical engineering. Age 36. Comprehensive metallurgical background including three years of university teaching, two years of plant industrial engineering. Now in sixth year as research metallurgist developing alloy cast irons and steels; molybdenum and tungsten powder metals and alloys. Can supervise. Will move from Pittsburgh for satisfactory position. Box 1-30.

HEAT TREATER: Seven years of heat treating aluminum and steel aircraft and maintenance parts in electric furnaces. Would appreciate opportunity of learning how to operate salt bath and gas furnaces. Eastern section of country preferred. Age 38, married, family. Box 1-35.

MECHANICAL - METALLURGICAL ENGINEER: M.E., M.S., age 27. Excellent background of five years' experience in ferrous and nonferrous metal processing, forming and machining. Desires position in production or development where common sense as well as theoretical knowledge is desirable. May not be able to solve all your problems, but not because of lack of effort. Box 1-40.

METALLURGIST: B.S. in chemical engineering. Experience: four years plant metallurgist in ferrous and nonferrous precision plant, of which two years was as plant manager; six years quality control work, production problems and trouble shooting in the following fields—aviation, ordnance and presses—three years in supervisory capacity. Box 1-45.

YOUNG EXECUTIVE: Metallurgist-business man. Production, sales and administrative experience with noncorrosive, heat resistant alloys, stainless steel, brass, monel, etc. Successful operation of own sales organization as contract-machinist supplying screw machine and related products to national manufacturing organizations. Desires position as salesman in established line, or as administrative assistant to energetic executive. Will relocate. Box 1-50.

METALLURGIST: M.S., B.S. degree in metallurgy from large eastern university. Age 29, married, veteran. Three years' diversified experience in physical metallurgy, metallography, heat treating, and physical testing. Two years industrial experience in stainless steel research. Desires position in research or development with greater opportunity for advancement. Box 1-55.

METALLURGICAL ENGINEER: With extensive background in cold drawing and working of ferrous and nonferrous metals. Successful experience in management, research and development. Thoroughly versed in the economies of materials and their usage. Seventeen years' experience. Available for full time or consulting. Metropolitan New York or mid-Atlantic states. Box 1-60.

CHEMICAL ENGINEER: Twelve years' experience, chiefly research and development in nonferrous metallurgy and high temperature ceramics. Some teaching and production background. Capable of setting up ceramic-metallurgical laboratory with experimental foundry—sand or centrifugal. Proven ability to put original ideas into practice. Married, age 32. Desires position in development with administrative responsibility. Box 1-65.

METALLURGICAL ENGINEER: Five years of college work with a B.S. degree in metallurgy. Fourteen years of diversified practical plant experience in the heat treatment of tools, dies, production items, and nonferrous metals. Management and production experience. Progressive, efficient Location unimportant. Box 1-70.

TOOL HARDENER: Twelve years of experience. Has studied heat treating at Carnegie Institute of Technology. Age 32, married, family. Would consider position outside Pittsburgh. Box 1-75.

METALLURGICAL TRAINEE: Young, able, very willing to learn. Received B. Met. E. in June 1949 from Polytechnic Institute of Brooklyn. Would like training program where he could gain all-around knowledge with a final view to being placed in production work. Location immaterial. Box 1-80.

METALLURGIST: Age 25, veteran, married. Bachelor degree in metallurgy January 1950 from Temple University. Nine months' experience as shipfitter. Four years' experience as photographer and photo-finisher. Prefers training program in any phase of metallurgy leading to responsible position. Philadelphia area preferred, but will locate anywhere. Box 1-85.

PHYSICAL METALLURGIST: Ph.D., February 1950. Thorough metallurgical education and several years of research experience. Last two years spent on study of fluidity of molten metals. Good reading knowledge of French and German. Desires position in research, development, or in teaching with opportunity to do research. Age 24, married, willing to locate anywhere. Box 1-90.

FOUNDRY MELTER OR SUPERVISOR: Twenty-three years' experience in the metal industry as chemist, metallurgist, electric furnace melter, assistant and plant superintendent in the production of carbon, alloy and manganese steel castings, carbon and alloy steel forgings and rolled products. Background includes gray, white and malleable iron and nonferrous castings. Age 40. Box 1-95.

METALLURGICAL ENGINEER: Over 20 years' varied experience in production problems, atmosphere controlled heat treating, quality control and cost reduction and sales. Able to initiate and carry through to completion research and development work. Best of references. Box 1-100.

METALLURGIST: B.S. in Met. Two years' experience in electron tube manufacture. M.S. in Met., with research on phase diagrams of high-temperature alloys. Available for employment in March. Box 1-105.

METALLURGICAL ENGINEER: B.S. and M.S., Univ. of Mich. Age 37, married. Twelve years' diversified experience in steel mill and aircraft gas turbine manufacture. Excellent knowledge of high-temperature materials and testing. Desires responsible position with opportunity for advancement. Midwest preferred. Complete resume of experience and references on request. Box 1-110.

METALLURGIST: Ten years' experience. Broad background in abrasion and wear research. Interested in sales engineering or development of carbides, hard facing welding rods, cast alloys or toolsteels. Available on short notice. Location immaterial. Box 1-115.

METALLURGICAL ENGINEER: B.S. Univ. of Ill. Limited experience in automotive industry. Past year in production and development work with nonferrous metals. Seeks position in production or development. West or midwest preferred. Age 25, single. Box 1-120.

METALLURGICAL ENGINEER: Six years diversified metallurgical experience. Four years in lead smelter, lead and silver refineries, research problems on lead, silver, arsenic, antimony. One year electric furnace melting—cast irons and different steels; iron pipe foundry; diesel engine works. Desires position in development, industrial research, or production. Single, age 29 Box 1-125.

Production Figures Show Wider Use Of Stainless Sheet

Reported by W. S. White

Assistant Plant Engineer
Johnson Wire Works, Ltd.

A comparison of production figures for stainless steels in 1930 and 1948 prefixed the main subject of the talk by Ernest E. Thum, editor of *Metal Progress*, before the Montreal Chapter A.S.M. on Dec. 5. Mr. Thum spoke on "Developments in Stainless Steel and Alloys for High-Temperature Service".

In 1930, he said, U. S. production was 60,000 ingot-tons, approximately one-quarter in sheet form. In 1948 the combined U. S. and Canadian production was 700,000 ingot-tons, and better than 50% of this was sheet, sold at about $800 per ton! Nevertheless, there has been no essentially *new* industrial use for stainless since the end of the war.

In the matter of manufacture, Mr. Thum said that the greatest advance has been the blowing of oxygen into the melting furnaces to reduce the carbon quickly to a low figure—0.06% and even less—without the traditional loss of valuable alloys. This use of oxygen also simplifies scrap handling, since great care to obtain low-carbon scrap is no longer necessary.

A new stainless steel has been developed which is of considerable value in handling hot dilute sulphuric acid. Its composition is 20% chromium (to resist oxidation), 30% nickel (to resist sulphuric acid and improve the tolerance for copper), 3% copper (to resist sulphuric acid), 2% molybdenum (to resist pitting), and 0.07% max. carbon. This alloy can be worked into bar, sheet and tube. It is not as resistant to 60° Bé. sulphuric at 175° C. (the worst condition) as the silicon-iron castings, but the latter are very brittle.

Use of titanium as a hardener for 18-8 was suggested many years ago by Ffield, and recent improvements in melting practice have made its use commercial. An alloy containing 17% Cr, 7% Ni, 0.75% Ti and 0.06% C transforms to ferrite on cooling and is readily age hardenable by aging for ½ hr. at 950° F. and then quenching.

Mr. Thum then outlined the development of high-temperature alloys for steam turbines and the more recent gas turbines and jet engines. Despite a large amount of metallurgical work, the upper temperature limit for gas turbines has been increased only about 100° F. since the war. Jet engine men would really like materials which will withstand 3000° F., rather than the present ones good for approximately half that figure.

Since the top limit for alloys of the commonly available metals may be in the neighborhood of 1700° F., consideration is being given to the possibility of coating the blades. This may take place automatically. For example, the designers of the coal-fired gas turbines were afraid that the fly ash would erode the blades. Somewhat to their surprise, they discovered that, instead of eroding the blades, the ash coated them and protected them from erosion.

There are possibilities for turbine blades in the fields of nonmetals or combinations of metals and nonmetals. The greatest difficulty is to get a material of this sort that is not glass-brittle.

Muncie Past Chairmen Honored

Walter F. McCormack (Left), Assistant Metallurgist at Chrysler Corp., and Gene P. Davis, Plant Metallurgist at Warner Gear Division of Borg-Warner, Received Their Past Chairman Certificates at the October Meeting of the Muncie Chapter, A.S.M.

Ship Structures and Hardenable Steels Pose Problems in Welding

Reported by E. Dyble

Cleveland Diesel Engine Div., G.M.C.

Two phases of the broad subject of "Welding Metallurgy" were emphasized by S. L. Hoyt, technical advisor, Battelle Memorial Institute, in addressing the November meeting of the Cleveland Chapter A.S.M. These were the welding of large steel structures, with special reference to Liberty ships, and the welding of hardenable steels.

Marine architects and designers, Dr. Hoyt opined, should work together with the steel metallurgists and the welding engineers to consider all three phases of the problem. These are *(a)* how to make a suitable steel, *(b)* how to design for that steel, and *(c)* how to weld that steel. Only in this way are maximum economy and adequate safety to be assured.

A high-grade semi-killed steel should be principally used for merchant ship structures, and is selected for toughness at low sea temperatures. The structures should be designed and fabricated to relieve corner stresses and notch effects insofar as practical. Weldability tests were discussed in this connection. Current emphasis on "transition temperatures", Dr. Hoyt stated, is diverting attention from the even more significant "level of notch toughness" at low service temperatures.

Turning to the welding of hardenable steels, the speaker described a test for the determination of susceptibility to underbead cracking, which evaluated both steel and electrode. As examples, he cited work on aircraft steels, armor plate, and low-manganese steels. These are medium-carbon steels and if the heat-affected zone contains both residual austenite and hydrogen, cracks are prone to form on standing. The elimination of either will prevent cracking. In this connection, the role of steel structure in promoting or preventing cracking was discussed.

Focke Speaks at Louisville

Reported by G. W. Birdsall

Reynolds Metals Co.

Arthur E. Focke, national president of the American Society for Metals and chief metallurgist of Diamond Chain Co., Inc., spoke on "Radio-Isotopes in Industry" at the Dec. 6th meeting of the Louisville Chapter A.S.M.

Dr. Focke reviewed certain elements of nuclear physics, described instruments for measuring radioactivity, mentioned the precautions that are necessary, and told of various applications for radio-isotopes. Since his talk will be presented before many other A.S.M. chapters during the current season, a detailed report is not given here.

Modern Theories of Friction Lead to Improved Bearings

Reported by Sigmund L. Smith

Colorado School of Mines

Modern bearings had their beginnings around 1885, when a Mr. Towers pioneered a committee for research on oil films in bearings, Arthur F. Underwood told the Rocky Mountain Chapter A.S.M. on Nov. 18. Mr. Underwood, who is head of mechanical engineering department 5, General Motors Research Laboratories, spoke on "Modern Bearings and Their Materials".

This early research disproved the old idea that the friction to overcome is the metal-to-metal contact rather than an oil-to-oil friction. Later it was proven that high oil film pressure exists on the bearing side, and the film pressure is independent of the viscosity of the oil. The maximum oil film pressure will exist, bearing weight on the top of the shaft, on the center of the crown; and the pressure tapers off in all directions to zero and even to a vacuum on the "trailing" side.

The remainder of his talk was devoted to slides and a motion picture. Type of materials used for bearings, specifications for bearings, and causes of bearing failures were illustrated.

The older designs of bearings had a PV figure (pressure × velocity) of 10,000, while present-day designs may have a PV as high as 250,000 — a tremendous improvement in both lubrication and bearing materials.

Today bearings are getting away from the old theory that to make a good bearing material you must have hard crystals in a matrix of soft material. Lead is probably the most widely used bearing metal. However, during the war one-fourth of the silver produced was used in airplane bearings.

Four of the specifications considered in choosing a bearing material are non-scoring [illegible], compressive strength index, fatigue strength index, and deformability index. No one material meets all of these specifications.

The fifth specification is corrodibility (dissolving of the bearing material by the oil). Corrosion can usually be stopped by inhibitors. However, cadmium alloys (excluding cadmium-indium) are corrodible. The same is true if tin is below 3%.

Mr. Underwood concluded his talk with a brief discussion of new materials used in bearings, such as sintered copper and nickel on steel, aluminum bearings, and sintered copper-lead alloy on steel.

Riedel on Toolsteel Failures

Reported by H. O. Nordquist

Manager, Alloy & Stainless Steel Dept. Joseph T. Ryerson & Son, Inc.

J. Y. Riedel, tool steel engineer of the Bethlehem Steel Co., talked before a joint meeting of the American Society of Tool Engineers and the St. Louis Chapter A.S.M. on Dec. 1. Speaking on "Toolsteel Failures, Their Cause and Cure", Mr. Riedel pointed out the most common failures that are encountered in heat treating and finishing various tools and dies. Details of his talk were previously reported in the December issue of *Metals Review*, page 19.

Notch Tests Indicate Reliability of Steel For Difficult Service

Reported by Lester M. Stern

Field Engineer
North American Mfg. Co.

Some recent research on alloy steels was reviewed by W. S. Mounce of the New England Technical Section, International Nickel Co., at the November meeting of the Worcester Chapter A.S.M. Special emphasis was given to the practical importance of these newer developments to the designer and the plant metallurgist.

The necessity for through hardening, if the standard tensile property relationships are to be attained, was demonstrated. Other properties of steels are even more quickly affected by the type of structure developed by the quench, Mr. Mounce said.

A recent survey of industrial quenching practice has indicated that less than one-fifth of the parts are completely hardened by the quench; and that the slack quenched pieces, even after tempering, will not develop full notch toughness. Often the usual interpretations of tensile properties and end-quench hardenability measurements fail to reveal just why differences exist in the service performance of the various grades of alloy steels.

Notch tests were used, therefore, to investigate the reliability of steels for difficult service. In this type of test, failure occurs with little plastic flow, a condition similar to that of the brittle service failure of a usually ductile steel.

A program of notch-impact, notch-tensile, and notch-slow bending tests of alloy steels was reviewed. These properties may differ appreciably from one type of steel to another, even though simple tensile properties and end-quench hardenability curves of the steels may be similar. Notch test properties were found to be affected by chemical composition and the presence of slack quenched structures. Even very small amounts of the "upper nose" products—ferrite, pearlite, or upper bainite—will reduce the notch strength of lightly tempered steels. The results to date have indicated that nickel alloy steels are above average in notch strength.

Mr. Mounce concluded that, when predicting the performance of alloy steels in difficult service, the usual tensile properties and end-quench hardenability curves should be supplemented by all available information on the transformation characteristics of the steels under consideration.

PR Plating Process Offers Opportunities in New Field

Reported by Philip C. Barr, Jr.

Pennsylvania State College

George W. Jernstedt, manager of electroplating projects at Westinghouse Electric Corp., addressed the Penn State Chapter A.S.M. on "Electrodeposition" at its November meeting.

Mr. Jernstedt talked primarily about trends in metal finishing in the automotive and appliance fields. Briefly he compared the various older plating methods with the new periodic reverse current method. In this so-called PR plating process, the organic addition agent can be eliminated in the cyanide copper bath, yet extraordinary leveling properties are obtained in the process, and superior physical properties in the product. Because of the high cost of buffing and the tendency to buff through the plate, the possibility that this process offers of eliminating the buffing phase is important.

In closing, Mr. Jernstedt noted that the field of PR plating is comparatively new and holds many opportunities for young men interested in that phase of electrodeposition.

ADVERTISERS INDEX

Austin Book Co. .....

Holden Co., A. F. ....Front and Back Cov

Laboratory Equipment Corp. 31

Lindberg Engineering Co. 29

Ryerson & Son, Inc., Jos. T. 12

Sentry Co. 38

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